NEW YORK SHOW

FOR SALE AT ALL NEWS STANDS TWENTY-FIVE CENTS A COPY

Complete

MOTOR AGE

VOLUME XXI CHICAGO, JANUARY 4, 1912 NUMBER 1

How an Experienced Buyer Figures his Car

He gets right down to the value of the things that **make** a car—the engine—the materials—the grade of workmanship. Size, color and shape are important features. But he looks at these **after** he goes over the essentials.

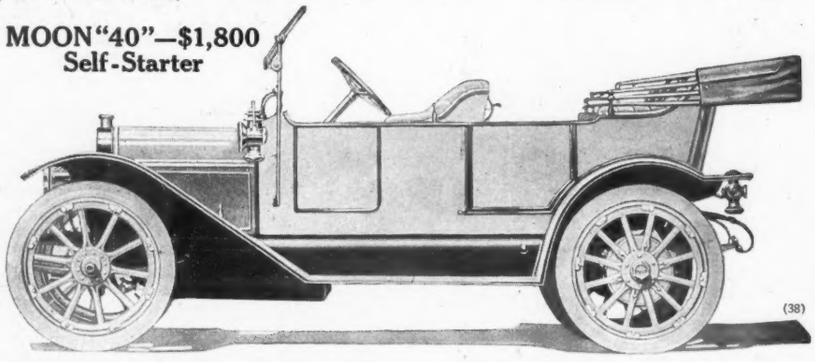
MOON "40" is built for the rigid inspection of the **experienced** buyer. He sees the famous MOON 45-horse-power T-head Motor, perfected by five years' hardest tests. He notes the 4½-inch bore and 5-inch stroke—the **long stroke** motor—with strong four-bolt Connecting Rods and three-bearing Crank Shaft; the SELF STARTER with three years of experiment behind it. He sees the big 36-inch Wheels, with bigger spokes than any other car at the price—Demountable and Quick Detachable Rims—36x4 Tires, front and rear.

Then he takes in the MOON "40's" long Wheel Base, 120 inches—its beautiful, roomy, all-metal body in nickel and black finish. He observes the Full Equipment—more equipment than has ever been listed before.

Dealers! Moon's 1912 proposition to agents is unusually attractive. It is open right now.

Represented by dealers almost everywhere. If not in your city, communicate with us.

MOON "40"—$1,800
Self-Starter



(38)

MOON MOTOR CAR COMPANY, 4403 North Main Street, St. Louis, Mo.

FISK

Pure Para Inner Tubes

Kentucky Dealer Well Pleased With Fisk Service

"We have been handling Fisk Tires and Tubes for the past ten months and they have given us entire satisfaction. Our customers are exceedingly well pleased with the service out of this line and we are now using Fisk goods almost exclusively."

(Name on Request)

Inquire among Fisk Tire Users before you buy again

THE FISK RUBBER COMPANY
Department B **CHICOPEE FALLS, MASS.**

Direct Factory Service in 34 Cities

VOL. XXI, NO. 1 CHICAGO, JANUARY 4, 1912 $3.00 PER YEAR

MOTOR AGE

The Big Shows of 1912

NEW YORK, Jan. 3—Madison Square garden opens its doors for the last time next Saturday when the twelfth annual motor car show starts, this time under the auspices of the new Automobile Board of Trade, successor to the Association of Licensed Automobile Manufacturers, previously promoter of the annual event. The historic old pile which has so endeared itself to New Yorkers is about to be torn down to make room for a more massive structure, and the motor car show is positively the last exhibition that will be staged in its broad halls.

The opening of the garden exhibition marks the beginning of a show season that is far more extensive than any that has gone before. While of course there only will be the three national shows as usual, there is a minor circuit that spreads out all over the country and which will not be completed until spring rolls around again. Instead of dying out, interest in shows seems to be increasing and towns which heretofore never have thought of trying this sort of promotion already are on the schedule, while there are others yet to hear from.

The national show circuit is a peculiar one this year because there are no warring factions as in the past. There is no so-called independent show and, while there is to be a counter attraction at the Grand Central palace later on, there is no clash—not even friendly rivalry. The Automobile Board of Trade is taking care of its members as best it can in the garden, while in the palace will be found other big concerns which are showing under the

THE PASSING of the GARDEN

auspices of the National Association of Automobile Manufacturers.

As before both the garden and the Chicago shows will be divided into two sections; that is, the first week will be devoted to pleasure cars, and the second to commercial motor vehicles. The garden show will open for part 1 next Saturday night, and will have on view pleasure motor cars, motor cycles and accessories. This affair will last until January 13, when there will be a 2-day intermission to allow for the shifting of scenery, then the commercial motor vehicles and the accessories will go on for a show that will last to January 20.

The National Association of Automobile Manufacturers, in charge of the palace show, is booked to open its doors January 10, which, of course, means a conflict with the garden. But it is a friendly conflict and an intentional one and the dates are so arranged that out-of-town visitors may come here and see both shows and thus obtain a comprehensive grasp of the American motor industry. Of course it is impossible to get everyone under one roof, but with simultaneous shows this way it is thought the public can be satisfied. The N. A. A. M. will show both pleasure cars and commercial vehicles in the week it will be open.

The Chicago Show

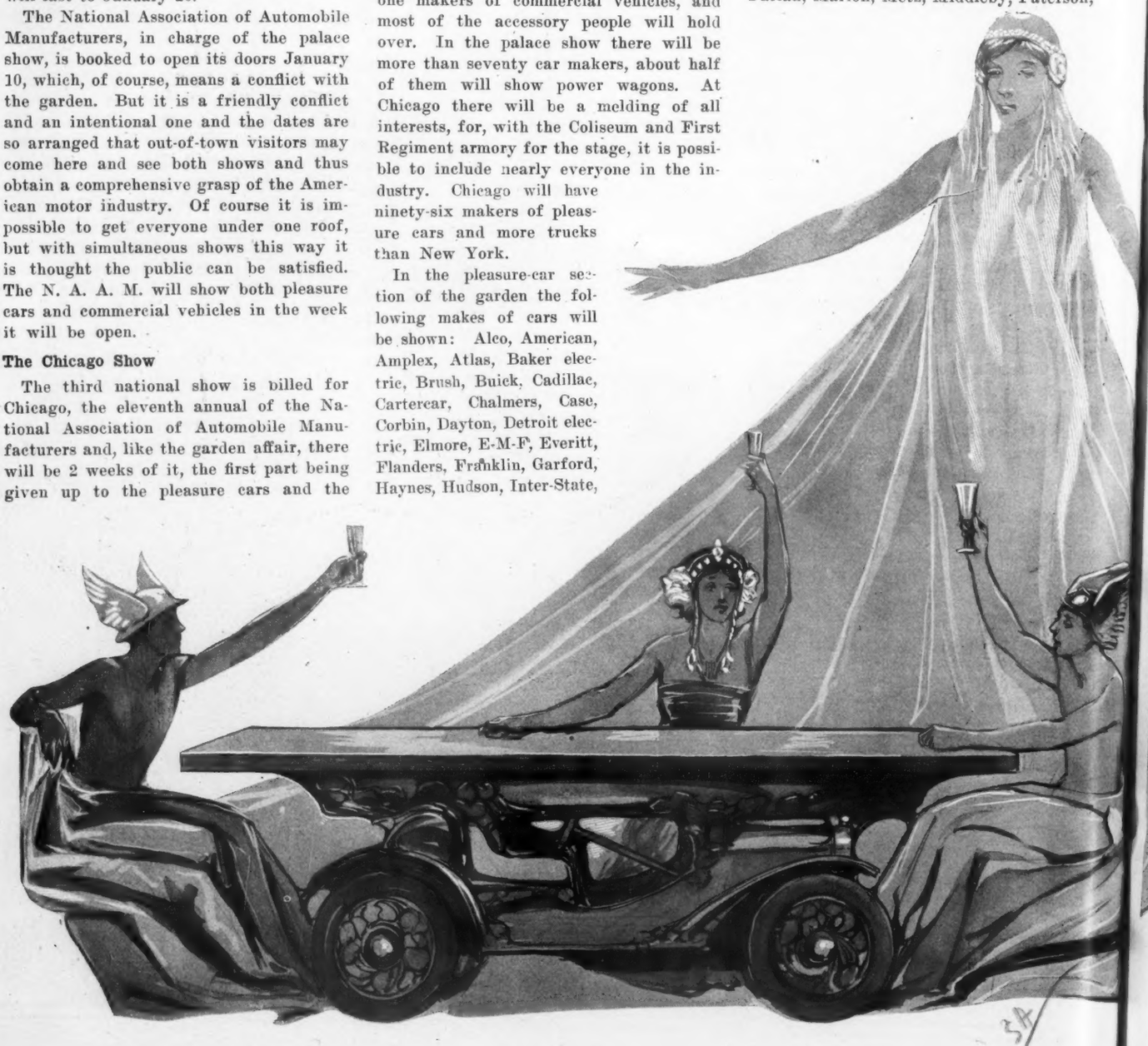
The third national show is billed for Chicago, the eleventh annual of the National Association of Automobile Manufacturers and, like the garden affair, there will be 2 weeks of it, the first part being given up to the pleasure cars and the second to the trucks. The Chicago show opens January 27 and closes February 3, and after 1 day in which to make the change, the commercials will cut in and hold the attention of the motoring world until February 10.

Magnitude of the Shows

One may get an idea of the magnitude of the three national shows by studying the statistics. In part 1 of the garden there will be sixty exhibitors of pleasure cars, including gasoline and electrics; 311 accessory manufacturers and nineteen motor cycle concerns; in the commercial section the second week there will be thirty-one makers of commercial vehicles, and most of the accessory people will hold over. In the palace show there will be more than seventy car makers, about half of them will show power wagons. At Chicago there will be a melding of all interests, for, with the Coliseum and First Regiment armory for the stage, it is possible to include nearly everyone in the industry. Chicago will have ninety-six makers of pleasure cars and more trucks than New York.

In the pleasure-car section of the garden the following makes of cars will be shown: Alco, American, Amplex, Atlas, Baker electric, Brush, Buick, Cadillac, Cartercar, Chalmers, Case, Corbin, Dayton, Detroit electric, Elmore, E-M-F, Everitt, Flanders, Franklin, Garford, Haynes, Hudson, Inter-State, Jackson, Knox, Locomobile, Lozier, McIntyre, Marquette, Matheson, Marmon, Maxwell, Mercer, Mitchell, Moline, Moon, National, Oakland, Ohio, Oldsmobile, Overland, Packard, Palmer-Singer, Peerless, Pierce-Arrow, Pope-Hartford, Premier, Pullman, Reo, Selden, S.G.V., Simplex, Speedwell, Stearns, Stevens-Duryea, Thomas, Waverley electric, White, and Winton.

The palace show offers the following bill of fare in the way of pleasure cars: Abbott-Detroit, Auburn, Bergdoll, Cole, Columbus, Correja, Cino, Cutting, De Tamble, Fiat, Great Western, Herreshoff, Hupmobile, Imperial, King, Klinekar, Lion, McFarlan, Marion, Metz, Middleby, Paterson,



Paige-Detroit, R.C.H., Rambler, Regal, Schacht, Stutz, Stuyvesant, Velie, Warren-Detroit, and Wescott.

At Chicago the pleasure-car line takes in the Abbott-Detroit, Alco, American, Auburn, Austin, Amplex, Baker electric, Bergdoll, Borland electric, Broc electric, Buick, Brush, Cadillac, Cartercar, Case, Chalmers, Cutting, Colby, Cole, Columbia, Columbus electric, Corbin, Crow, Cunningham, Davis, Detroit electric, De Tamble, Elmore, Everitt, E-M-F, Fiat, Flanders, Franklin, Garford, Great Western, Glide, Halladay, Haynes, Hudson, Hupmobile, Imperial, Inter-State, Jackson, Knox, Kisselkar, Krit, King, Lexington, Lion, Locomobile, Lozier, McIntyre, McFarlan, Marmon, Marquette, Matheson, Maxwell, Mitchell, Michigan, Moline, Moon, National, Oakland, Ohio electric, Ohio, Oldsmobile, Overland, Packard, Paterson, Peerless, Pierce-Arrow, Pope-Hartford, Premier, Pratt-Elkhart, Pullman, Rambler, Rauch & Lang electric, Regal, Reo, Republic, R.C.H., Schacht, Selden, Staver, Stearns, Stutz, Standard electric, Stevens-Duryea, Thomas, Warren-Detroit, Waverley electric, Westcott, White, Winton, Woods electric and Zimmerman.

New York Show History

Show history in New York city is a long and interesting story, marking a battle between warring factions that started in 1906 and which continued up to last winter. The first New York show was held in Madison Square garden November 3-10, 1900, there being fifty-one exhibitors in all, thirty-nine showing cars. The second show was held November 2-9, 1901, with ninety-three exhibitors. During this show the National Association of Automobile Manufacturers was organized and handled the show which was staged in the garden January 17-24, 1903, with 150 exhibitors. The N. A. A. M. then had clear sailing for several years, promoting the 1904 show from January 16 to 23 with 185 exhibitors, and the fifth exhibition January 14-21, 1905, with 250 exhibitors.

It was during this show that it was discovered the garden was not large enough to hold all those who wished to take part in the annual exhibition and the clash of interests resulted in the formation of the Association of Licensed Automobile Manufacturers, which sprung a coup on its rivals by securing a lease on the garden and brought out the announcement that only A. L. A. M. members could secure space. Thereupon the independents got together and organized the American Motor Car Manufacturers' Association, which secured the Sixty-ninth armory. This resulted in two rival shows during the winter of 1906, the garden affair being held January 13-20, with 210 exhibitors, seventy being car makers, the N. A. A. M. withdrawing from the New York field. From 1907 on to 1910 the garden and palace affairs clashed each winter until the independents dissolved. Even this did not end the clash, for last winter there was another independent show in the palace, which, however, was not of an alarming size. An attempt to repeat this winter came to naught, and the National Association of Automobile Manufacturers got the palace.

The seventh show in the garden was held January 12-19 and brought out forty-two car makers and 202 accessory concerns. Then it was determined to try the experiment of holding the show earlier, and that same year, November 3-10, the eighth show was run with sixty-eight cars and 225 accessory concerns. The experiment was not a success and when the ninth show was put on it was held from January 16 to 23, 1909. Last year the affair was spread over 2 weeks, the first week being given up to pleasure cars and the second to commercials. There were 392 exhibitors the first week, fifty-four being cars, and 286 the second, with fifty-two having trucks.

Industry in Good Shape

The motor industry faces an apparently prosperous season and conservative estimates show that the 1912 product will not be much larger than that of 1911—just a healthy increase. It would seem as if the 1911 output reached about 190,000 and, taking into consideration the enthusiasm of some of the makers and paring down the estimates, 210,000 would seem a fair figure for the coming season. Few if any of the makers are cutting their production, while in one or two cases, notably among the low-priced makers, there has been a vast increase. There will be an increase in the number of commercial vehicles that are to be produced. Some say there were 9,000 power wagons put on the market last year, and these same critics say that the demand is so brisk that they see no reason why this number should not be doubled in 1912.

In this connection it is interesting to note that despite the popularity of the motor car, there has been no appreciable falling off in the use of horse-drawn vehicles. The last census report shows there are 7,000,000,000 horse-drawn rigs in use in the United States, and that there are 21,000,000 horses and 3,000,000 mules. As to the number of motor cars in use, everyone seems to be agreed that at the present time there probably are between 400,000 and 450,000 running. Some states do not require registration, which, of course, makes it a matter of guess work, but it would seem as if about 450,000 would hit it right on the national count.

Refinements in Detail the 1912 Trend

This Is an Era in Which the Designer Aims To Give the Purchaser Every Convenience Possible, Which Has Resulted in General Adoption of Self-Starters, Fore-Door Bodies and Other Features

THIS is certainly a year of rivalry! Nearly every maker has half a dozen arguments ready for the prospective. It is just a question of expediency which is thrust forth. This is a year of self-starters; no fewer than sixty-three firms are announcing that they are equipping them. It is a year of sleeve valves, marking, as it does, the actual introduction of motors of this type in America. It is a year of longer-stroke motors—we have scarcely half a dozen really long-stroke motors; it is a year of electric lighting; it is a full-equipment year, nearly every car sold is rationally equipped to start touring with; it is a year of fore doors or flush-sided bodies; it is a year of inclosed body types—all inclosed bodies typifying comfort in one or more of their many stages; and it is a left-hand control year—mounting the steering column on the left side and placing the change-speed and emergency brake levers either in the center of the floor boards or at the left or putting one lever at the left and the other at the right.

Features of the Year

There are many other arguments for the 1912 car. It is a year of monobloc motors both in the four and six-cylinder divisions; it is a year of better upholstery in cars; it is a year of more foot room in the tonneau; it is a year of ventilators for fore-door bodies; it is a year of larger tire sizes; it is a year of either two-spark magnetos or magnetos with an automatic means for governing the spark; it is a year of stronger wheels—more spokes, heavier spokes, heavier hub castings or forgings and more hub flange bolts; it is a year of larger brakes and a more pronounced leaning to fabric facing materials; it is a year of demountable rims as stock equipment without extra charge; it is a quiet year—everybody has been trying to make the motor and rear axle quieter by valve and tappet cover plates, by bearing adjustments and by many other means; it is an accessibility year—the old type of rear axle on which it cost $24 to get the pinion on the rear end of the propeller shaft adjusted with the differential bevel, is passing and with the new designs and adjustment it is possible to have this work done in a garage for $1.50; and it is a year of comfort—the cars have better spring suspension, they are easier-riding vehicles, the seats are more suited to the human form, there are more baggage-carrying facilities; you can light the acetylene headlights from the seat; it is not so difficult to position the jack under the front or rear axle when changing a tire; and the fenders render the body a little more mud-proof.

This is going to be an economy year: The motors are smaller than they were last year. For several seasons Motor Age has compared motor sizes with previous years and to make such comparisons possible and intelligent the car field has been divided into four major classes and the average motor size in each determined. Last year the average motor in the $1,000 field was 21.23 horsepower, this year it is 21.18 horsepower. This is not much reduction; in the average $1,500 car it was 29.53 horsepower last year but has risen to 30.61 this year—this is the only case of power increase; in the $2,500 car it was 35.60 horsepower a year ago, it is 35.45 today—this is a decrease; and in the $4,000 car of 1911 it was 43.66 horsepower, but this has dropped to 43.40 for the present season.

The six-cylinder motor has equipped itself with wings, so much has it gained with the advent of this year. Packard has joined the hosts, so have White, Stoddard, Everitt, Fiat, Garford, Chalmers; and firms like Peerless, Mitchell, and others which have had one model in seasons past have jumped to two and three different models for the present season.

The six-cylinder makers have cast tradition to the winds and have brought out many features. Three companies have gone so far as to cast the cylinders in one block, White, Fiat and Everitt leading in this class; four others have revived the methods of casting the six cylinders in groups of three each, the exponents of this school being Stoddard, Garford, Chalmers and Palmer & Singer.

Monobloc-Cast Motors

It would be impossible in a paragraph to summarize all that has been done in the monobloc casting in four-cylinder motors in the past year. There are no fewer than sixty-seven different chassis models using this form of casting. In this list are all of the old ones and a perfect regiment of new ones. The old list contains such names as White, Chalmers, Ford, Flanders, Everitt, Hudson, and Staver; and among the new advocates are Garford, Cutting, Colby, R. C. H., Schacht, Stoddard-Dayton, Only, Metz, Halladay,

Buyers' Guide To American Cars

General Features of Pleasure Cars for 1912 To Aid the Prospective Purchaser—The Motor Vehicles Are Arranged in Four Classes on Arbitrary Price Basis

The tables on these pages are intended to offer the prospective purchaser or others interested in motor cars a means of comparing some of the more important features of the 1128 styles placed on the market for the coming season by 174 American makers. In order to assist in such a comparison the cars are divided arbitrarily into four classes according to price. Those in the $1,000 division range in price from $350 to $1,249 inclusive; those in the $1,500 class include $1,250 to $1,999; those in the $2,500 class are listed from $2,000 to $2,999; and the $4,000 class embraces all cars priced at $3,000 or over.

In the body column are shown the stock bodies offered by each maker. The price given is that quoted by the maker, with the equipment regularly offered in each case. In the horsepower column the rating found by the formula of Society of Automobile Engineers is given; and is calulated from the bore and number of cylinders of the

BUYERS' GUIDE

$1,000 CLASS

NAME AND MODEL.	BODY.	Price	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front	TIRES. Rear.	Table No.
Alpena, 30	Fore-door roadster	$1100	2	25.6	112	34x3½	34x3½	6
Alpena, 30	Touring	1175	5	"	"	"	"	"
Alpena, 30	Fore-door touring	1200	5	"	"	"	"	"
Alpena, 30	Detachable tonneau	1200	2 or 4	"	"	"	"	"
Anna	Democrat	950	2	22.0	100	34x3½	34x3½	13
Auburn, 30-L	Fore-door touring	1100	5	25.6	112	34x3½	34x3½	19
Auburn, 30-L	Fore-door roadster	1100	5	"	"	"	"	"
Brush, 1912	Liberty runabout	350	2	6.4	80	28x3	28x3	34
Brush, 1912	Standard runabout	450	2	"	"	"	"	"
Buick, 34	Roadster	900	2	22.5	91	32x3½	32x3½	35
Buick, 35	Fore-door touring	1060	4	"	102	"	"	36
Buick, 28 and 29	Roadster	1075	2	25.6	108	34x3½	34x3½	37
Cameron, 28	Fore-door roadster	1000	2	24.0	104	32x3	32x3	40
Cartercar, H	Touring	1200	4	25.6	102	32x3½	32x3½	46
Clark, T	Torpedo roadster	1100	2	26.4	114	34x3½	34x3½	60
Courier, 1912	Roadster	1150	2	22.5	108	32x3½	32x3½	73
Courier, 1912	Touring	1150	5	"	"	"	"	"
Crow Elkhart, 50	Fore-door roadster	875	3	22.5	110	32x3	32x3	77
Crow Elkhart, 52	Touring	1100	5	25.6	113	32x3½	32x3½	78

Economy of Operation the Keynote

Motors Are Made Smaller, Monobloc-Cast Engines Being Used on Sixty-Seven Different Chassis—Six-Cylinder Field Augmented Considerably—Sleeve-Valve Type Most Prominent—Other Tendencies Reviewed

American, Penn and many others. These are not all small motors; there are only two of them that have a bore of 5 inches or over and the highest horsepower is a little over 40. Some of them use the L-head casting, many use the T-head and a few have the valve-in-the-head design.

There are many who use the two-bearing crankshaft, in fact, their number is increasing. Nearly all use circulating oiling and the majority remain firm with pump water circulation. It is hard to say whether it is right to cast the intake and exhaust manifolds integrally or not. This is more or less a question of convenience. A concern that expects to enter racing uses the separate manifold, whereas one that is opposed to contests casts everything integrally with the cylinder block and advances the big argument of simplicity when it comes to the selling of the car.

From actual figures—not a semblance of guess work considered—the L-type cylinder has gained. It now controls 55 per cent of the field, with the T-head having a 30 per cent following, the valve-in-the-head with 12 per cent following, sleeve valves with 1 per cent and a combination of head-and-side with a 2 per cent clientele. The L-type has gained because it is a cheaper manufacturing proposition and is more in accord with the price-reduction wave which has characterized the past year.

Popularity of Sleeve-Valve Motor

This is essentially a sleeve-valve year—it has been a landslide for this design of motor. Enough here to say that Stearns, Stoddard, Columbia and Atlas have adopted the Knight double-sleeve type. A complete description of all non-poppet valve types, with descriptions, illustrations and arguments pro and con is given on other pages of this issue.

Exactly half of the different 1912 chassis locate the gearset amidship for this year; 26 per cent make it a unit with the back axle and 24 per cent make it a unit with the motor. Making the gearset a unit with the motor is gaining, several recruits have joined these ranks for the first time this year. This construction reduces the number of universal joints to one; it entirely eliminates the necessity of universal coupling between the clutch and gearset, except of the sliding type, and also dispenses with the joint in advance of the rear axle, particularly where a torsion tube encloses the propeller shaft. This reduces manufacturing cost.

The floating back axle is used. It has gained enormously during the year. By actual count it now dominates 43 per cent of the entire field, that is, it is used on 43 per cent of all the different chassis type. Semi-floating axles have a 51 per cent following and the stationary axle as used on chain-driven cars has but a 6 per cent clientele. The increase has not been entirely with the small maker, several of the good standard concerns shifting quietly to the floating design. The change to floating design is largely due to accessibility of differential mounting. It is generally recognized that the introduction of the stamping for a rear axle housing, the drum idea is accentuated and the axle is more noisy. To counteract this has led to ready provision for adjusting the pinion with respect to the differential bevel. This also means an easy method of removal, and with the floating design, the large differential inspection opening and the mounting of the driving pinion and differential gear as a unit this can easily and cheaply be obtained. Quietness is making itself felt in the axle and gearset as well as in the motor.

The Four-Speed Gearset

More progress was looked for in the four-speed gearset. A year ago it was anticipated that many would adopt it but they have not. There are sixty-one different chassis using it out of a total 381; this is but 17 per cent. The motor size is such that a three-speed set suffices, but with the reduction in horsepower which is coming, there will be a more general movement towards the four-speed set. While many like to talk about the elimination of the gearset with the increase of flexibility of the motor, still there is the growing demand for more gears so that when the change has to be made the proper ratio for the work is at hand. Although four forward variations are being installed the gearset size is reduced. The shafts are stouter and shorter. Instead of the square shaft, the round section one with six integral keys is used. It has less spring in rotation and consequently the gears remain quieter. The gearbox cover is more easily removed, in fact it gives the impression that it is occasionally desirable to look inside the box to see if the proper amount of lubricant is in place, a point that is often neglected.

Pleasure Vehicles for Coming Season

A Classification of the 1128 Styles of Motor Cars Offered for 1912 With Data As to Body Style, Seating Capacity, S.A.E. Horsepower Rating and Wheelbase

motor without reference to the stroke. More detailed specifications of the materials and design of the chassis are offered on pages 62 to 73. Reference to them is made easy by the use of the figures in the last column in the tables below, which correspond with those in the first column of the chassis specifications.

The 1128 cars listed below have 381 different chassis models. The 120 cars placed in the $1,000 class are supplied with 65 different chassis, and are listed at an average price of $945. The average price of the 368 cars of the $1,500 class, which are fitted with 122 chassis, is $1,595. Turning to the $2,500 class, we find that there are 261 different cars with 82 chassis models, listed at an average price of $2,570. In the $3,000 division there are 379 cars on 112 chassis, at an average price of $4,350.

Taking all the cars manufactured for 1912, regardless of the price classification, we find that the average American car can be obtained for $2,506

BUYERS' GUIDE—Continued

$1,000 CLASS—Continued

NAME AND MODEL.	BODY.	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front	TIRES. Rear.	Table No.
Crow Elkhart, 52	Roadster	1200	2	25.6	113	32x3½	32x3½	78
Cutting, A-30	Torpedo roadster	1200	2	25.6	116	34x4	34x4	83
Cutting, A-30	Torpedo touring	1250	5	"	"	"	"	"
Dalton, 6	Runabout	900	2	20.3	106	32x3½	32x3½	85
Day Utility, R	Fore-door convertible	1150	5	25.6	110	32x3½	32x3½	87
De Tamble, K-L-M	Torpedo roadster	1075	2	28.9	116	34x4	34x4	88
Dispatch, E	Torpedo roadster	700	2	.....	96	36x3	36x3	89
Dispatch, E	Rumble	725	3	.....	"	"	"	"
Dispatch, G	Torpedo roadster	850	2	.....	120	36x3½	36x3½	90
Dispatch, G	Surrey	850	4	.....	"	"	"	"
Dispatch, G	Fore-door touring	900	5	.....	"	"	"	"
Dispatch, G	Coupe	1000	2	.....	"	"	"	"
Duryea, Electa	Runabout	750	2	.....	80	34x1¾	40x1½	92
Duryea, Buggy type	Buggyaut	600	2	.....	84	"	42x1½	93
Duryea, Runabout	Runabout	700	2	.....	100	30x3	36x3	94
Elmore, R-26	Roadster	1150	2	.....	108½	32x3½	32x3½	95
Elmore, R-26	Touring	1200	4	.....	"	"	"	"
E-M-F, A-1912	Roadster	1100	2	25.6	112	32x3½	32x3½	98

BUYERS' GUIDE—Continued

$1,000 CLASS

NAME AND MODEL.	BODY.	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear.	Table No.
E-M-F, A-1912	Demi-tonneau	1100	4	25.6	112	32x3½	32x3½	98
E-M-F, A-1912	Fore-door touring.	1100	5	"	"	"	"	"
Flanders, S.	Roadster.	750	2	20.3	102	30x3	30x3½	105
Flanders, S.	Suburban.	800	4	"	"	"	"	"
Flanders, S.	Coupe	1050	2	"	"	"	"	"
Flanders, S.	Touring.	800	4	"	"	32x3	32x3	106
Ford, T.	Roadster.	590	3	22.5	100	30x3	30x3½	107
Ford, T.	Touring.	690	5	"	"	"	"	"
Ford, T	Town car	900	6	"	"	"	"	"
G. J. G., Junior.	Raceabout	1000	2	22.5	104	32x3½	32x3½	119
G. J. G., Junior.	Runabout.	1125	2	"	"	"	"	"
G. J. G., Junior	Fore-door runabout	1175	2	"	"	"	"	"
Halladay, 30	Roadster.	1100	2	22.5	114	32x3½	32x3½	130
Halladay, 30	Touring.	1100	5	"	"	"	"	"
Herreshoff, 25	Runabout.	950	3	18.3	100	32x3	32x3	139
Herreshoff, 25.	Roadster.	950	2	"	"	"	"	"
Herreshoff, 25 Touring.	Touring.	1150	4	18.3	110	32x3½	32x3½	140
Hupmobile, Runabout.	Runabout.	750	2	16.9	86	30x3	30x3	143
Hupmobile, Runabout.	Torpedo	850	2	"	"	"	"	"
Hupmobile, Runabout.	Coupe	1100	3	"	"	"	"	"
Hupmobile, Touring.	Roadster.	850	2	16.9	110	30x3	31x3½	144
Hupmobile, Touring.	Touring.	900	5	"	"	"	"	"
Hupmobile, 32	Torpedo touring	900	5	"	106	30x3½	"	144A.
Jackson, 26 and 28	Torpedo roadster	1100	2	25.6	110	32x3½	32x3½	153
Jackson, 32	Touring.	1100	5	"	"	"	"	154
Johnson, A.	Special roadster.	1200	2	28.9	112	34x3½	34x3½	158
Jonz, B	Roadster.	750	2	.....	104	32x3½	32x3½	161
Jonz, B	Roadster.	750	4	.....	"	"	"	"
Jonz, B—air-cooled	Roadster.	750	2	.....	"	"	"	162
Jonz, B—air-cooled	Roadster.	750	4	.....	"	"	"	"
Kenmore, D.	Runabout.	700	2	18.3	100	30x3	30x3	164
Kenmore, D.	Roadster.	725	3	"	"	"	"	"
Kenmore, D	Tourabout	750	4	"	"	"	"	"
Kenmore, D	Touring.	775	5	"	"	"	"	"
Kenmore, D	Fore-door.	800	5	"	"	"	"	"
Krit, A.	Runabout	800	2	22.5	96	32x3	32x3	178
Krit, K	Touring.	900	5	"	106	32x3½	32x3½	179
Marathon, K-20	Fore-door roadster	685	2	16.9	90	34x3½	34x3½	196
Marathon, K-20.	Fore-door touring.	850	5	"	96	"	"	197
Marathon, L-30	Fore-door roadster	1000	2	25.6	116	"	"	198
Marathon, L-30.	Touring	1200	5	"	"	"	"	"
Maxwell, Messenger	Runabout.	600	2	16.2	86	28x3	28x3	210
Maxwell, Mascotte	Roadster.	950	2	25.6	104	32x3½	32x3½	211
Maxwell, Mascotte	Touring.	980	5	"	"	"	"	"
Maxwell, Mercury.	Roadster.	1150	2	28.9	110	34x4	34x4	212
McIntyre, F-12	Fore-door touring.	1125	5	25.6	114	34x2½	34x3½	216
Metz, 22.	Runabout.	495	2	22.5	90	30x3	30x3	219
Mitchell, 2-4.	Roadster.	950	2	22.5	100	32x3½	32x3½	223
Mitchell, 4-4.	Touring.	1150	4	"	115	"	"	223A
Motorette, R	Runabout.	385	2	.....	74	28x3	29x3½	233
Oakland, 30.	Roadster.	1200	2	25.6	106	34x3½	34x3½	237
Oakland, 30	Touring.	1200	5	"	"	"	"	"
Only	Runabout.	1000	2	28.9	112	31x4	31x4	246
Overland, 58	Runabout.	850	2	22.5	96	32x3½	32x3½	248
Overland, 59	Torpedo roadster	900	2	25.6	116	"	"	249
Overland, 59	Fore-door touring.	900	5	"	"	"	"	"
Overland, 60	Fore-door touring.	1200	5	27.3	114	34x4	34x4	250
Overland, 60	Torpedo touring	1200	4	"	"	"	"	"
Paige, Beverly	Beverly touring.	975	5	22.5	104	32x3½	32x3½	260
Paige, Beverly.	Kenilworth roadster.	975	3	"	"	"	"	"
Paige, Beverly.	Pinehurst surrey.	900	4	"	"	"	"	"
Paige, Beverly.	Rockwell runabout.	925	2	"	"	"	"	"
Penn, R. F. and T.—4	Torpedo roadster	1000	2	22.5	105	32x3½	32x3½	272
Penn. R. F. and T.—4	Fore-door touring.	1100	4	"	"	"	"	"
Petrel, 25.	Roadster.	850	2	22.5	98	32x3	32x3	274
Petrel, 35.	Touring.	1000	4	22.5	98	32x3	33x3½	274
Pickard.	Runabout.	800	2	25.6	104	32x3½	32x3½	276
Pickard	Roadster.	875	3	"	"	"	"	"
Pickard	Surrey.	950	4	"	"	"	"	"
Pickard	Touring.	950	4	"	"	"	"	"
Pickard.	Touring.	975	5	"	"	"	"	"
R. C. H., Runabout.	Runabout.	700	2	16.9	86	30x3	30x3	297
R. C. H., Runabout.	Runabout.	750	4	"	"	"	"	"
R. C. H., Touring	Touring.	850	5	"	110	31x3½	31x3½	298
Regal, N	Runabout.	900	2	22.5	100	32x3½	32x3½	300
Regal, L.	Touring.	1000	5	27.3	109	"	"	301
Regal, L	Fore-door touring.	1050	5	"	"	"	"	"
Regal, L.	Torpedo touring	1050	4	"	"	"	"	"
Reo, Fifth	Roadster.	1000	2	25.6	112	34x3½	34x3½	303
Reo, Fifth	Detachable tonneau.	1055	4	"	"	"	"	"
Reo, Fifth	Fore-door touring.	1055	5	"	"	"	"	303
Richmond, N	Runabout.	950	2	32.4	106	32x3½	32x3½	305
Richmond, N.	Touring.	1050	5	25.6	"	"	"	"
Ritter, 1912.	Torpedo runabout.	685	2	16.9	90	30x3	30x3	307
Roader, 20.	Runabout.	650	2	15.6	105	—x3	—x3	308
Roader, 20	Fore-door touring.	700	4	"	"	"	"	"
Rogers, C.	Runabout.	700	2	18.0	90	36x1¾	36x1¾	309
Rogers, C.	Surrey.	750	4	"	"	"	"	"
Schacht, S	Runabout	825	2	21.0	103	32x3½	32x3½	310
Schacht, B.	Runabout	850	.....	"	"	"	"	"
Schacht, B-T	Touring.	900	5	"	"	"	"	"
Union, 3.	Runabout.	650	2	20.3	100	30x3	30x3	349
Warren, 12-30.	Roadster.	1175	2	25.6	110	34x3½	34x3½	354

$1,500 CLASS

Abbott-Detroit, 30.	Runabout.	1275	2	27.3	110	34x3½	34x3½	1
Abbott-Detroit, 30.	Fore-door touring.	1350	5	"	"	"	"	"
Abbott-Detroit, 44.	Runabout.	1775	2	32.4	120	36x4	36x4	2
Abbott-Detroit, 44.	Touring.	1800	7	"	"	"	"	"

The Self-Starters Feature of the Year

Sixty-three makers are fitting this device as part of their equipment and each day sees more recruits added to the list of those who seek to do away with motor cranking

THIS year will be emphatically a self-starter year. It will mark the beginning of the era of emancipation of the motorist from the labor of cranking. With sixty-three of the makers fitting engine starters to their product as regular equipment for the new year and announcements of other recruits to the automatic starting ranks coming in nearly every day, there is no doubt of the landslide to this feature. The fact that there were at most three or four cars fitting self-starters as stock equipment at this time last year, against more than one-third of the makes in 1912 shows that car construction has reached a point where the makers feel that to a certain extent they can rest on their oars in the matter of car design and devote more thought to the demands of comfort for the users.

A particularly good sign of the permanency of the self-starting feature is the fact that many of the makers who have

CARS USING SELF-STARTERS

CAR	STARTER	TYPE
Alpena	Prest-O-Lite	Acetylene
Amplex	Own	Air
Atlas	Ever Ready	Mechanical
Babcock	Disco	Acetylene
Bergdoll	Ever Ready	Mechanical
Berkshire		
Cadillac	Delco	Electric
Case	American	Acetylene
Chalmers	Own	Air
Colby	Disco	Acetylene
Cole	Prest-O-Lite	Acetylene
Corbitt		Acetylene
Correja	Prest-O-Lite	Acetylene
Croxton-Keeton		Electric
Duryea	Own	Hand Lever
Empire	Prest-O-Lite	Acetylene
Everitt	Disco	Acetylene
G. J. G.		Gasoline
Great Western	Prest-O-Lite	Acetylene
Halladay		Acetylene
Havers	Prest-O-Lite	Acetylene
Hudson	Disco	Acetylene
Imperial	Ever Ready	Mechanical
Inter-State	Apico	Electrical
Jonz		
King	Disco	Acetylene
Klinekar	Ever Ready	Mechanical
Lexington	Prest-O-Lite	Acetylene
Lion	Victor	Acetylene
Luverne	Prest-O-Lite	Acetylene
Marion	Prest-O-Lite	Acetylene
Marmon	Prest-O-Lite	Acetylene
McFarlan		
McIntyre		Acetylene
Midland	Own	Air
Moline	Prest-O-Lite	Acetylene
Moon	Disco	Acetylene
Nance	Janney	Air
National	Disco	Acetylene
Otto		
Paige-Detroit	Disco	Acetylene
Peerless	Ever Ready	Mechanical
Pratt-Elkhart	Own	
Pullman	Disco	Acetylene
Rambler	Ever Ready	Mechanical
Rayfield		Mechanical
R. C. H.		Acetylene
Regal		
Republic		
Saurer	Own	
Schacht	Prest-O-Lite	Acetylene
Selden	Disco	Acetylene
Simplex	Disco	Acetylene
Standard		Electric
Stevens-Duryea	Disco	Acetylene
Stuyvesant	Ever Ready	Mechanical
Suburban		
Triumph		
Velie	Prest-O-Lite	Acetylene
Warren-Detroit		
Westcott	Disco	Acetylene
Winton	Own	Exhaust gas
Zimmerman	Auto-Starter	Hand lever

Six Major Classes of Motor-Starters

Acetylene gas, compressed air, electrical, mechanical, exhaust gas and gasoline types in the field—First named best represented at present — Development of ideas along these lines is rapid

announced one type, and others who have as yet made no announcement, are testing out designs of their own which will be installed as soon as certain details have been perfected.

The field of motor starters as a whole may be divided into six major classes, depending on the medium used to store the energy required to give the crankshaft of the motor its initial revolutions. These classes are acetylene gas, compressed air, electrical, mechanical, exhaust gas and gasoline. The acetylene starters will be the most widely represented in American cars this year. In general they consist of a method for introducing into one or all of the cylinders of the motor a mixture of acetylene gas and air under pressure from the lighting tank so that this mixture will take the place of the normal gasoline mixture which is present when the motor is performing its natural functions.

MAKES OF SELF-STARTERS

ACETYLENE GAS STARTERS

NAME	MAKER
American	American Starter & Carbureter Mfg. Co.
A A	Auto Appliance Mfg. Co.
Briggs & Stratton	Briggs & Stratton Co.
Disco	Ignition Starter Co.
Dual	Dual Automatic Starting & Lighting Co.
E Z	Auto Starter Co.
Hanna	J. H. Valentine Co.
Home	Home Lignt Co.
Instantaneous	Instantaneous Auto Starter Co.
Invincible	Invincible Starter Co.
Meteor	Meteor Auto Tank Co.
Prest-O-Starter	Prest-O-Lite Co.
Victor	Start-O Co.

COMPRESSED AIR STARTERS

A B C	Artizen Brass Co.
Crescent	Crescent Air System Co.
Janney-Steinmetz	Janney & Steinmetz Co.
Never Miss	Wilson Motor Starter Co.
Prather Pneumatic Clutch	Pneumatic Clutch Motor Co.
Start-Lite	The Start-Lite Co.

ELECTRIC STARTERS

Apico	Apple Electric Co.
Dean	Dean Electric Co.
Delco	Dayton Electric Laboratories Co.
Geisler	Geisler Bros. Storage Battery Co.
O'Neill	O'Neill Electric Starting & Lighting Corporation.
Warner	Warner Electric Co.

GASOLINE STARTERS

Northeast	Northeast Electric Co.
Shur-Go	Motor Starting Co.

MECHANICAL STARTERS

Elder	Elder Mfg. Co.
Ever Ready	American Ever Ready Co.
Gardner	Gardner Engine Starter Co.
Glenard	National Motor Device Co.
Hercules	Hercules Motor Starter Co.
Keen	Keen Starter Co.
Kimball	Kimball Tire Casing Co.
Neher	L. M. Neher
Pull-Man	A. M. Walstrom
Reagan	Reagan Clutch Co.
Star	Star Starter Co.
Smith	S. L. T. Mfg. Co.
Volkmar	Volkmar Auto Starter Co.
Wilkinson	Brown & Murray Co.

BUYERS' GUIDE—Continued

$1500 CLASS

NAME AND MODEL.	BODY.	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear	Table No.
Abbott-Detroit, 44	Fore-door touring	1800	7	32.4	120	36x4	36x4	2
Alpena, 40	Fore-door roadster	1600	2	27.3	120	"	"	7
Alpena, 40	Detachable tonneau	1600	4	"	"	"	"	"
Alpena, 40	Fore-door touring	1600	5	"	"	"	"	"
American, 20	Roadster	1250	2	22.5	105	36x3½	36x3½	8
Ames, 42	Roadster	1600	2	27.3	116	36x4	36x4	12
Ames, 42	Fore-door touring	1600	5	"	"	"	"	"
Apperson, 4-45	Touring	1600	5	32.4	114	34x4	34x5	14
Apperson, 4-45	Roadster	1750	2	"	"	"	"	"
Arbenz, 40	Roadster	1675	2	27.3	120	36x4	36x4	17
Arbenz, 40	Torpedo	1700	4	"	"	"	"	"
Arbenz, 40	Touring	1750	5	"	"	"	"	"
Auburn, 35-L	Fore-door touring	1400	5	27.3	116	34x3½	34x3½	20
Auburn, 40-M	Fore-door touring	1650	5	32.4	120	36x4	36x4	21
Auburn, 40-M	Fore-door roadster	1750	2	"	"	"	"	"
Auburn, 40-M	Detachable fore-door	1750	5	"	"	"	"	"
Bergdoll, C	Roadster	1500	3	25.6	115	34x3½	34x3½	30
Bergdoll, C	Toy tonneau	1500	4	"	"	"	"	"
Bergdoll, C	Touring	1500	5	"	"	"	"	"
Bergdoll, D	Touring	1900	5	25.6	115	36x4	36x4	31
Bergdoll, D	Torpedo	1900	4	"	"	"	"	"
Buick, 29	Fore-door touring	1250	5	25.6	108	34x3½	34x3½	37
Buick, 43	Fore-door touring	1800	5	32.4	116	36x4	36x4	38
Cadillac, 1912	Touring	1800	5	32.4	116	36x4	36x4	39
Cadillac, 1912	Phaeton	1800	4	"	"	"	"	"
Cadillac, 1912	Roadster	1800	2	"	"	"	"	"
Cadillac, 1912	Torpedo	1900	4	"	"	"	"	"
Cameron, 29	Fore-door	1250	5	24.0	110	32x3½	32x3½	41
Cameron, 30	Fore-door	1250	2	36.1	114	34x3½	34x3½	42
Cameron, 32	Fore-door	1550	5	"	120	"	"	43
Carhartt, J	Runabout	1350	3	26.4	108	34x3½	34x3½	44
Carhartt, J	Touring	1350	5	"	"	"	"	"
Cartercar, R	Roadster	1500	2	27.3	112	36x4	36x4	47
Cartercar, R	Touring	1600	5	"	"	"	"	"
Cartercar, R	Coupe	1700	3	"	"	"	"	"
Case, 30	Roadster	1750	2	28.9	116	34x4	34x4	49
Case, 30	Torpedo	1850	4	"	"	"	"	"
Case, 30	Fore-door	1850	5	"	"	"	"	"
Case, 40	Roadster	1900	2	32.4	120	36x4	36x4	50
Chalmers, 30	Roadster	1500	2	25.6	115	34x2½	34x3½	53
Chalmers, 30	Pony tonneau	1500	4	"	"	"	"	"
Chalmers, 30	Touring	1500	5	"	"	"	"	"
Chalmers, 36	Touring	1800	5	28.9	115	36x4	36x4	54
Chalmers, 36	Fore-door toy tonneau	1800	4	"	"	"	"	"
Chalmers, 36	Roadster	1900	2	"	"	"	"	"
Clark, E	Torpedo roadster	1250	2	27.3	116	34x3½	34x3½	58
Clark, E	Fore-door touring	1250	5	"	"	"	"	"
Clark, G	Fore-door touring	1400	5	"	120	"	"	59
Coey, 1912	Touring	1850	5	38.4	124	36x4	36x4	61
Coey, 1912	Roadster	1850	2	"	"	"	"	"
Colby, L	Roadster	1250	2	26.4	116	36x4	36x4	62
Colby, L	Touring	1250	5	"	"	"	"	"
Colby, H	Roadster	1750	2	27.3	121	"	"	63
Colby, H	Racing	1750	2	"	"	"	"	"
Colby, H	Touring	1750	5	"	"	"	"	"
Correja, A-B-C	Runabout	1450	2	28.9	105	34x3½	34x3½	71
Correja, A-B-C	Coupe	1750	2	"	"	"	"	"
Correja, T-R-S	Torpedo touring	1650	4	"	125	36x4	36x4	72
Crawford, 12-30	Roadster	1400	2	27.3	115	34x3½	34x4	74
Crawford, 12-30	Touring	1500	4	"	"	"	"	"
Crawford, 12-30	Touring	1500	5	"	"	"	"	"
Crawford, 12-35	Touring	1650	4	25.6	120	34x4	"	75
Crawford, 12-35	Touring	1650	5	"	"	"	"	"
Crow-Elkhart, 52	Touring	1250	5	25.6	113	32x3½	32x3½	78
Crow-Elkhart, 55	Touring	1450	5	27.3	116	34x3½	34x3½	79
Crow-Elkhart, 56	Fore-door touring	1600	5	30.6	122	37x4½	37x4½	80
Crow-Elkhart, 56	Fore-door touring	1750	5	30.6	122	37x4½	37x4½	80
Crow-Elkhart, 58	Touring	1750	5	32.4	122	36x4	36x4	81
Cutting, A-30	Torpedo touring	1250	5	25.6	116	34x4	34x4	83
Cutting, T-55	Torpedo touring	1850	5	36.1	116	"	36x4	84
Davis, 40	Fore-door torpedo	1850	5	27.3	112	36x4	36x4	86
Davis, 40	Fore-door torpedo	1850	4	"	"	"	"	"
Davis, 40	Torpedo roadster	1850	2	"	"	"	"	"
De Tamble, K-L-M	Torpedo touring	1250	5	28.9	116	34x4	34x4	88
De Tamble, K-L-M	Torpedo touring	1500	5	"	"	"	"	"
Elmore, R-27	Touring	1250	5	.....	108½	32x3½	32x3½	96
Elmore, 37	Demi-tonneau	1600	4	.....	114	34x4	34x4	97
Elmore, 37	Touring	1600	5	.....	"	"	"	"
Everitt, 30	Touring	1250	5	25.6	110	34x3½	34x3½	99
Everitt, 30	Roadster	1250	2	"	"	"	"	"
Everitt, 4-36	Touring	1500	5	25.6	115	34x4	34x4	100
Everitt, 6-48	Roadster	1850	2	38.4	127	36x4	36x4	101
Everitt, 6-48	Touring	1850	5	"	"	"	"	"
Everitt, 6-48	Touring	1900	4	"	"	"	"	"
Everitt, 6-48	Touring	1950	6	"	"	"	"	"
Franklin, G runabout	Runabout	1650	2	18.3	100	32x3½	32x4	109
G. J. G., Junior	Fore-door touring	1250	5	22.5	104	32x3½	32x3½	119
Great Southern, 30	Roadster	1400	2	25.6	113	34x4	34x4	124
Great Southern, 30	Fore-door touring	1500	5	"	"	"	"	"
Great Western, 40	Touring	1600	5	28.9	114	34x3½	34x3½	126
Great Western, 40	Semi-torpedo	1650	5	"	"	"	"	"
Great Western, 40	Roadster	1600	2	"	"	"	"	"
Great Western, 40	Torpedo	1750	5	"	"	"	"	"
Great Western, 40	Detachable fore-door	1750	5	"	"	35x4	35x4	127
Haynes, 20	Roadster	1800	2	28.9	114	34x4	34x4	133
Haynes, 20	Touring	1850	4	"	"	"	"	"
Haynes, 20	Touring	1850	5	"	"	"	"	"
Havers, 6-44	Touring	1850	5	33.8	122	36x4	36x4	136
Havers, 6-44	Roadster	1850	2	"	"	"	"	"
Henry, W	Touring	.....	5	25.6	115½	34x4	34x4	137

BUYERS' GUIDE—Continued

$1500 CLASS—Continued

NAME AND MODEL.	BODY.	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear.	Table No.
Henry, W.	Roadster		2	25.6	115½	34x4	34x4	137
Henry, C	Touring		5	27.2	116	"	"	138
Henry, C	Toy tonneau		4	"	"	"	"	"
Henry, C	Roadster		2	"	"	"	"	"
Henry, C	Speedster		2	"	"	"	"	"
Herreshoff, 25	Coupe	1400	2	18.3	100	32x3½	32x3½	139
Hudson, Roadster	Roadster	1600	2	25.6	114½	34x4	34x4	141
Hudson, Roadster	Mile-a-minute	1600	2	"	"	32x4	32x4	"
Hudson, Touring	Touring	1600	5	"	"	34x4	34x4	142
Hudson, Touring	Torpedo	1600	4	"	"	"	"	"
Hudson, Touring	Roadster	1600	2	"	"	"	"	"
Illinois, 1912	Baby tonneau	1750	4	28.9	120	36x3½	37x4	145
Illinois, 1912	Semi-torpedo	1750	5	"	"	"	"	"
Imperial, 33-32	Torpedo roadster	1250	2	28.9	114	34x3½	34x3½	146
Imperial, 33-32	Semi-torpedo	1250	2	"	"	"	"	"
Imperial, 34	Semi-torpedo	1400	5	29.3	116	34x4	34x4	147
Imperial, 44	Semi-torpedo	1750	5	32.4	120	36x4	36x4	148
Imperial, 50	Touring	1850	5	36.1	118	34x4	34x4	149
Imperial, 51	Roadster	1850	4	"	"	"	"	"
Inter-State, 30-A	Roadster	1700	2	32.4	118	34x4	34x4	150
Inter-State, 30-A	Fore-door touring	1750	5	"	"	"	"	"
Jackson, 42	Touring	1500	5	32.4	118	34x4	34x4	155
Jackson, 52	Touring	1800	5	36.1	124	36x4	36x4	156
Johnson, A	Racer	1500	2	28.9	112	34x3½	34x3½	158
Johnson A	Touring	1600	5	"	"	"	"	"
Johnson, A	Fore-door runabout	1650	3	"	"	"	"	"
Johnson, A	Fore-door touring	1650	5	"	"	"	"	"
King, 36	Roadster	1565	2	23.2	115	34x4	34x4	165
King, 36	Touring	1565	5	"	"	"	"	"
Kisselkar, 30	Fore-door racer	1500	2	28.9	116	34x4	34x4	166
Kisselkar, 30	Fore-door touring	1500	2	"	"	"	"	"
Kisselkar, 40	Fore-door semi-tonneau	1850	5	32.4	118	35x4½	35x4½	167
Kisselkar, 40	Fore-door racer	1850	2	"	"	"	"	"
Klinekar, 4-30	Touring	1750	5	25.6	118	34x4	34x4	170
Klinekar, 4-30	Toy tonneau	1750	4	"	"	"	"	"
Klinekar, 4-30	Roadster	1700	2	"	"	"	"	"
Lambert, 66-B	Detachable tonneau	1400	4	27.3	107	32x3½	32x3½	180
Lambert, 66-B	Touring	1500	5	"	112	"	"	181
Lambert, 99-C	Roadster	1650	2	"	"	35x4	35x4	182
Lambert, 99-B	Torpedo	1700	4	"	115	"	"	183
Lambert, 99-A	Touring	1700	5	32.4	"	34x4	34x4	184
Leader, 40	Fore-door touring	1800	5	32.4	124	36x4	36x4	185
Lenox	Touring	1800	5	27.3	116	34x4	34x4	186
Lenox	A. B	1900		"	"	"	"	"
Lenox	Touring	1800	4	"	"	"	"	"
Lenox	Roadster	1800	3	"	"	"	"	"
Lenox	Runabout	1800	2	"	"	"	"	"
Lexington, D-F	Roadster	1775	2	27.3	117	34x4	34x4	187
Lexington, D-F	Touring	1775	5	"	"	"	"	"
Lexington, F	Touring	1975	5	32.4	122	36x4	36x4	188
Lexington, F	Demi-tonneau	1975	5	"	"	"	"	"
Lion, 40	Roadster	1550	2	32.4	116	36x4	36x4	189
Lion, 40	Touring	1600	5	"	"	"	"	"
Luverne, 540	Touring	1850	5	30.6	124	34x4	34x4	194
Marathon, M-40	Roadster	1400	4	28.9	118	34x4	34x4	199
Marathon, M-40	Touring	1500	5	"	"	"	"	"
Marathon, M-40	Torpedo touring	1600	5	"	120	"	"	200
Marathon, N-50	Touring	1800	5	32.4	121	36x4	36x4	201
Marathon, N-50	Roadster	1800	4	"	"	"	"	"
Marion, 35	Fore-door touring	1285	5	25.6	111	32x4	32x4	202
Marion, 36	Roadster	1285	2	"	"	34x4	34x4	203
Marion, 37	Touring	1285	5	"	"	"	"	"
Marion, 46	Roadster	1750	2	27.3	120	36x4	36x4	204
Marion, 47	Touring	1750	4	"	"	"	"	"
Marion, 48	Touring	1750	5	"	"	"	"	"
Maxwell, Special	Fore-door touring	1280	5	28.9	114	34x4	34x4	213
Midland, L-3	Fore-door roadster	1900	2	32.4	115	34x4	34x4	220
Mitchell, 5-4	Touring	1350	5	28.9	112	34x4	34x4	224
Mitchell, 5-6 and 2-6	Touring	1750	5	33.8	125	36x4	36x4	225
Mitchell, 5-6 and 2-6	Roadster	1750	2	"	"	"	"	"
Moline, 35	Touring	1700	5	25.6	114	37x4	37x4	227
Moline, 35	Roadster	1700	2	"	"	36x3½	36x3½	228
Moline, 35	Roadster	1600	4	"	"	"	"	"
Moon, 30	Touring	1600	5	32.4	115	34x4	34x4	229
Moon, 30	Torpedo	1600	4	"	"	"	"	"
Moon, 30	Roadster	1600	2	"	"	"	"	"
Moon, 30	Raceabout	1650	2	"	"	"	"	"
New Parry, 35	Touring	1450	5	28.9	116	32x—	34x—	236
New Parry, 35	Roadster	1350	2	"	"	"	"	"
New Parry, 35	Phaeton	1400	4	"	"	"	"	"
Oakland, 40	Touring	1450	5	27.3	112	34x4	34x4	238
Oakland, 40	Roadster	1450	3	"	"	"	"	"
Oakland, 40	Coupe	1900	3	27.2	112	"	"	238
Only	Touring	1250	4	28.9	112	31x4	31x4	246
Otto	Demi-tonneau	1850	4	28.9	123	34x3½	34x3½	247
Otto	Roadster	1850	3	"	"	"	"	"
Overland, 59	Coupe	1250	3	25.6	106	32x3½	32x3½	249
Overland, 61	Fore-door touring	1500	5	30.6	118	34x4	34x4	251
Overland, 61	Torpedo touring	1500	4	"	"	"	"	"
Paige, Beverly	Coupe	1600	4	22.5	104	32x3½	32x3½	260
Paterson, 35	Touring	1250	5	25.6	108	32x3½	32x3½	264
Paterson, 45	Touring	1800	5	32.4	120	36x4	36x4	265
Pathfinder, 40	Touring	1750	5	27.3	118	34x—	34x—	266
Pathfinder, 40	Roadster	1750	2	"	"	"	"	"
Pathfinder, 40	Phaeton	1750	4	"	"	"	"	"
Penn, T-R	Runabout	1350	2	27.3	115	34x3½	34x3½	273
Penn, T-5	Touring	1400	5	27.3	"	"	"	"
Petrel, 45	Toy tonneau	1500	4	30.6	115	34x3½	34x3½	275
Petrel, 55	Touring	1500	5	"	"	"	"	"
Petrel, 65	Fore-door toy tonneau	1600	4	"	"	"	"	"
Petrel, 75	Fore-door touring	1600	5	"	"	"	"	"

Worm-Geared Axle Problem of Year

Foreign Experts Assert Manufacturer with Reasonably Silent Engine and Gearbox Gets Good Results Through the Use of This Device—Some of the Advantages Claimed for this Method of Construction

"ANY maker with a reasonably silent engine and gearbox, who after trial has abandoned worm gearing on the rear axle has made a mistake. Either he has not understood the problem or has been betrayed by his factory. He may positively like noise." This extract from the Autocar on worm gear in motor cars voices generally the feeling on worm drive by those who have used it. The statement was made by an engineer not connected with any car-building establishment, but interested in general engineering work.

J. S. Critchley, Motor Age's London correspondent, in speaking of worm drive, says: "The questions of advantage of worm drive over bevel gear drive are: 1—The complete absence of noise. 2—Should either worm or wheel become worn silent running is little effected. 3—Great strength of the worm teeth owing to their form. 4—Wide range of gear reduction possible in the rear axle. 5—Reduction in the size of the rear axle housing. 6—Alternative above and below positions of the worm on the axle, thus offering latitude in design."

Against these advantages he places the following disadvantages: "1—Great frictional losses incurred unless both the worm and the wheel are perfectly satisfactory as to design, manufacture and mounting in the axle. 2—The need for very careful lubrication. 3—A slight increase in starting effort. 4—Increased first cost."

F. W. Lanchester the English engineer who is properly considered the father of worm drive as applied to pleasure cars, speaking on the problem of manufacturing the worm and gear in a factory said recently: "It is quite true that the manufacture of the Lanchester type of worm involves a considerable tool equipment, but the manufacture with this tool equipment is as ideal a repetitional process as could be wished for. Both the Lanchester and Daimler factories are fully equipped for the manufacture of the Lanchester worm and in America the Warner Gear Co., Muncie, Ind., will manufacture it, having secured the rights for the states and Canada."

A prominent American engineer recently writing on the subject of worm gear in Motor Age summed up some of his ideas on the subject as follows: "I have followed reports of laboratory tests with worm drive and they all fail to take into consideration the one great feature of the test, namely the efficiency of worm drive at low speeds under very heavy loads. I think there are two inherent faults in the worm, namely lack of efficiency at very low speeds and tendency to

Use In America Shows a Growth

Pierce-Arrow, Franklin and Blair Commercial Trucks and Delivery Wagons Fitting It, While Atlas Is Only Pleasure Car Which Has So Far Been Won Over—Good Lubrication An Essential Feature

heat under continual heavy running at high speeds. The worm is not so good for acceleration purposes as the bevel gear. At an average speed of 20 miles per hour for continuous road use the worm is just as effective as bevel gear drive."

The above quotations from representative engineers in America and abroad fully analyze the worm-drive situation. This drive has made progress in America in the commercial car field. It is used on the Pierce-Arrow trucks, on one of the Franklin trucks and on the Blair commercial vehicle. The only American pleasure car to be listed for 1912 with worm drive is the new Atlas, just announced, which is fitted with a sleeve-valve motor. The work of this car will be watched with interest.

There are several requisites in worm drive. Absolutely accurate manufacture is imperative. Members of Motor Age staff have watched worms and worm wheels in all stages of manufacture, inspection and test. The slightest inaccuracy in the worm must be corrected. In careful worm manufacture, each worm is tested in a special machine with the wheel it is to work with in the car. Often in rotating the worm two or three points will be found where they bind; this has to be corrected and the trouble in correcting it is not any worse than the work of silencing bevel gears for an axle.

The worm surface must be glass-hard and perfectly smooth. It is difficult to get the surface in this condition before the parts are assembled and with some makers it is customary to change the lubricant every 50 or 100 miles when the worm is first used, so as to remove all of the particles that wear off, in getting the smooth glass hard surface.

Worm lubrication is imperative. There must always be a film of oil between the contacting surfaces of the worm and those on the wheel. Where there is not oil, heating and wear will result. It is a case of wearing out oil and not wearing out the metal of the worm and the wheel. This presupposes the fact that surfaces of contact must be adequate, otherwise the pressure of the worm against the wheel will be too great and the necessary oil film will be destroyed. Satisfactory lubrication means good supporting of both the worm and the wheels in the axle housing. If the support of either gives way the accuracy of engagement is destroyed and the usefulness of the worm ended.

Many have urged that the worm will not be satisfactory in America because of the hills, but as a matter of fact there is not so much hill work for cars in America

BUYERS' GUIDE—Continued

$1500 CLASS—Continued

NAME AND MODEL.	BODY.	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear.	Table No.
Pilot, 40	Touring	1650	5	32.4	120	36x4	36x4	283
Pilot, 40	Roadster	1650	2	"	"	"	"	"
Pilot, 40	Speedster	1650	2	"	"	"	"	"
Pratt, 40	Roadster	1900	2	32.4	120	36x4	36x4	286
Pullman, 4-30	Fore-door touring	1675	5	26.4	118	34x4	34x4	289
Pullman, 4-30	Toy tonneau	1675	4	"	"	"	"	"
Rambler, Cross Country	Touring	1650	5	32.4	120	36x4	36x4	292
Rambler, Cross Country	Torpedo	1650	4	"	"	"	"	"
Rambler, Cross Country	Roadster	1600	2	"	"	"	"	"
Reading, 40	Roadster	1650	2	40.0	122	36x4½	36x4½	299
Reading, 40	Touring	1725	5	"	"	"	"	"
Reading, 40	Fore-door touring	1750	5	"	"	"	"	"
Regal, N	Coupe	1250	3	22.5	100	32x3½	32x3½	300
Regal, H	Touring	1400	5	28.9	118	34x4	34x4	302
Richmond, M	Runabout	1250	2	32.4	112	34x4	34x4	306
Richmond, M	Touring	1400	5	"	"	"	"	"
Schacht, G-F	Touring	1585	5	29.6	120	34x4	34x4	311
Schacht, G-F	Fore-door touring	1585	5	"	"	"	"	"
Shelby, 40	Torpedo	1275	2	27.4	120	36x3½	36x3½	317
Shelby, 40	Roadster	1275	4	"	"	"	"	"
Shelby, 40	Torpedo touring	1275	5	"	"	"	"	"
Spaulding, C-P	Fore-door touring	1550	5	25.6	112	32x3½	32x3½	323
Spaulding, C-P	Touring	1500	5	"	"	"	"	"
Spaulding, C-P	Toy tonneau	1500	4	"	"	"	"	"
Spaulding, C-P	Roadster	1450	2	"	"	"	"	"
Spaulding, E	Touring	1600	5	27.3	117	34x—	34x—	324
Spaulding, E	Toy tonneau	1600	4	"	"	"	"	"
Spaulding, E	Touring	1600	5	"	"	"	"	"
Standard, A	Touring	1800	5	28.9	110	34x3½	40x3½	373
Staver, 35-B	Fore-door top tonneau	1650	4	30.6	112	34x4	34x4	329
Staver, 35-B	Fore-door touring	1650	5	"	"	"	"	"
Staver, 35-B	Roadster	1650	2	"	"	"	"	"
Staver, 35-B	Racing roadster	1750	2	"	"	"	"	"
Staver, 35-F	Fore-door touring	1850	5	32.4	120	36x4	36x4	330
Stoddard-Dayton, Savoy	Touring	1450	5	25.6	112	33x4	33x4	338
Stoddard-Dayton, Savoy	Roadster	1450	4	"	"	"	"	"
Stoddard-Dayton, Savoy	Roadster	1350	2	"	"	"	"	"
Stoddard-Dayton, Stratford	Semi-torpedo	1750	2	27.3	114	36x4	36x4	239
Warren, 12-30	Fore-door demi-tonneau	1250	4	25.6	110	34x3½	34x3½	354
Warren, 12-30	Fore-door	1300	5	"	"	"	"	"
Warren, 12-35	Roadster	1415	2	27.3	112	34x3½	34x3½	355
Warren, 12-35	Touring	1500	5	"	"	"	"	"
Warren, 12-40	Touring	1700	5	28.9	116	34x4	34x4	356
Westcott, K	Touring	1800	5	32.4	120	36x4	36x4	357
Westcott, L	L	1800	4	"	"	"	"	"
Westcott, M	Roadster	1800	2	"	"	"	"	"
Wilcox, 35	Touring	1500	5	28.9	115	—x3½	—x3½	363
Wilcox, 36	Toy tonneau	1500	4	"	"	"	"	"
Wilcox, 37	Roadster	1500	3	"	"	"	"	"
Wilcox, 38	Fore-door	1600	5	"	"	"	"	"
Zimmerman, Z-40-R	Roadster	1485	2	33.0	116	34x3½	34x3½	365
Zimmerman, Z-40-F	Fore-door touring	1600	2	"	"	"	"	366

$2,500 CLASS

Abbott-Detroit, 30	Coupe	2150	3	27.3	110	34x3½	34x3½	1
American, 30	Fore-door touring	2250	4	32.4	118	37x4	37x4	9
American, 30	Fore-door roadster	2250	2	"	"	"	"	"
Amplex, Baby	Touring	2250	5	.....	120	34x4	34x4	368
Amplex, Baby	Roadster	2250	2	.....	"	"	"	"
Apperson, 450	Touring	2000	5	36.1	118	36x4	36x4½	15
Atlas, O	Runabout	2200	2	.....	128	36x4½	36x4½	18
Atlas, O	Touring	2400	5	.....	"	"	"	"
Autocar, 24-B	Touring	2650	5	30.6	117	37x4½	37x4½	26
Autocar, 24-B	Fore-door touring	2750	5	"	"	"	"	"
Babcock, H	Touring	2500	5	27.3	114	34x4	34x4	27
Bergdoll, C	Coupe	2100	2	25.6	115	34x3½	34x3½	30
Bergdoll, D	Coupe	2500	2	"	"	36x4	36x4	31
Berkshire, E	Runabout	2800	2	39.0	124	36x4	36x4½	32
Berkshire, E	Toy tonneau	2800	5	39.0	124	36x4	36x4½	32
Berkshire, E	Torpedo	2900	5	"	"	"	"	"
Berkshire, E	Touring	2900	7	"	"	"	"	"
Cadillac, 1912	Coupe	2250	4	32.4	116	36x4	36x4	39
Carhartt, B	Touring	2500	5	38.0	118	34x4	34x4	45
Carhartt, B	Roadster	2500	2	"	"	"	"	"
Carhartt, B	Demi-tonneau	2500	5	"	"	"	"	"
Cartercar, S	Touring	2100	7	32.4	122	36x4½	36x4½	48
Case, 30	Coupe	2450	3	28.9	116	34x4	24x4	49
Case, 30	Limousine	2850	7	"	"	"	"	"
Case, 40	Torpedo	2050	4	32.4	120	36x4	36x4	50
Case, 40	Fore-door	2050	5	"	"	"	"	"
Case, 40	Coupe	2650	3	"	"	"	"	"
Chalmers, 30	Coupe	2000	3	25.6	115	34x3½	34x3½	53
Cino, 4	Roadster	2000	2	30.6	116	34x4	34x4	56
Cino, 4	Touring	2000	4	"	"	"	"	"
Cino, 6	Touring	2750	5	38.4	130	36x4	36x4	57
Cino, 6	Touring	2750	7	"	"	"	"	"
Coey, 1912	Special torpedo	2000	5	38.4	124	36x4	36x4	61
Colby, L	Coupe	2250	3	26.4	116	36x4	36x4	62
Colby, H	Torpedo	2000	5	27.3	121	"	"	63
Colby, H	Coupe	2500	3	"	"	"	"	"
Colby, J	Runabout	2000	2	28.9	112	32x4	32x4	64
Cole, 1912	Roadster	2000	2	32.4	122	36x4	36x4	65
Cole, 1912	Toy tonneau	2000	4	"	"	"	"	"
Cole, 1912	Touring	2000	5	"	"	"	"	"
Cole, 1912	Coupe	2500	3	"	"	"	"	"
Corbitt	Torpedo roadster	2000	2	25.6	120	34x4	34x4	68
Corbitt	Fore-door toy tonneau	2000	4	"	"	"	"	"
Corbitt	Fore-door touring	2000	5	"	"	"	"	"
Corbin, 30	Touring	2000	5	32.4	115	34x4	34x4	69

BUYERS' GUIDE—Continued

$2,500 CLASS—Continued

NAME AND MODEL.	BODY	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear.	Table No.
Corbin, 30	Roadster	2000	2	32.4	115	34x4	34x4	69
Correja, T-R-S	Limousine	2300	4	28.9	125	36x4	36x4	72
Crawford, 12-40	Touring	2250	4	32.4	123	34x4	34x4	76
Crawford, 12-40	Touring	2250	5	"	"	"	"	"
Crow Elkhart, 59	Fore-door touring	2000	7	30.6	122	37x4½	37x4½	80
Crow Elkhart, 58	Touring	2000	7	32.4	122	36x4	36x4	81
Dorris, G	Touring	2500	5	30.6	115	36x4	36x4	91
Dorris, G	Roadster	2500	2	"	"	"	"	"
Dorris, G	Coupe	2650	3	"	"	"	"	"
Firestone-Columbus, 86-D	Roadster		3	27.3	116	34x4	34x4	102
Firestone-Columbus, 86-D	Touring		5	"	"	"	"	"
Firestone-Columbus, 60-D	Touring		5	32.4	121	36x4	36x4	103
Firestone-Columbus, 68-D	Touring		7	"	"	36x4½	36x4½	104
Firestone-Columbus, 68-D	Touring		7	"	"	"	"	"
Franklin, G	Touring	2000	5	25.6	103	32x4	32x4	110
Franklin, M	Touring	2800	5	31.6	116	34x4	34x4½	112
Franklin, M	Roadster	2800	2	"	"	"	"	"
Franklin, M	Torpedo phaeton	2800	4	"	"	"	"	"
G. J. G., Senior	Speedster	2250	2	36.1	121	34x4	34x4	120
G. J. G., Senior	Pirate	2500	2	"	"	"	"	"
G. J. G., Senior	Scout	2500	4	"	"	"	"	"
G. J. G., Senior	Comfort	2500	5	"	"	"	"	"
G. J. G., Senior	Touring	2750	7	"	"	"	"	"
Glide	Torpedo roadster	2000	2	36.1	120	36x4½	36x4½	121
Glide	Fore-door torpedo	2000	4	"	"	"	"	"
Glide	Fore-door torpedo	2150	5	"	"	"	"	"
Glide	Fore-door torpedo	2250	7	"	"	40x4	40x4	"
Great Southern, 50	Touring	2750	7	42.0	128	—x4	—x4½	125
Great Southern, 50	Roadster	2650	2	"	"	"	"	"
Grout, 35	Fore-door	2000	5	32.4	116	34x4	34x4	128
Grout, 35	Torpedo roadster	2000	2	"	"	"	"	"
Grout, 45	Fore-door	2500	5	36.1	123	36x4	36x4	129
Grout, 45	Fore-door	2850	7	"	"	"	"	"
Halladay, 40	Touring	2000	5	32.4	119	36x4	36x4	131
Halladay, 40	Toy tonneau	2000	4	"	"	"	"	"
Halladay, 40	Roadster	2000	2	"	"	"	"	"
Halladay, 50	Touring	2750	7	36.1	128	36x4½	36x4½	132
Halladay, 50	Toy tonneau	2750	4	"	"	"	"	"
Haynes, 21	Touring	2100	5	32.4	120	36x4	36x4	134
Haynes, 21	Coupe	2100	4	"	"	"	"	"
Haynes, 21	Coupe	2450	4	"	"	"	"	"
Haynes, 21	Limousine	2750	7	"	"	"	"	"
Interstate, 40	Fore-door touring	2400	5	32.4	118	36x4	36x4	151
Interstate, 41	Fore-door demi-tonneau	2400	4	"	"	"	"	"
Interstate, 42	Roadster	2400	2	"	"	"	"	"
Jenkins, 50	Touring	2750	5	36.1	118	36x—	36x—	157
Jenkins, 50	Fore-door	2850	5	"	"	"	"	"
Johnson, B	Fore-door touring	2500	5	32.4	112	36x4	36x4	159
Johnson, B	Touring	2400	5	"	"	"	"	"
Jonz, D	Touring	2100	5	32.4	120	36x4	36x4	163
Jonz, D	Demi-tonneau	2000	4	"	"	"	"	"
Jonz, D	Roadster	2000	2	"	"	"	"	"
Jonz, D	Coupe	2200	2	"	"	"	"	"
King, 36	Coupe	2165	3	23.2	115	34x4	34x4	165
Kisselkar, 50	Fore-door touring	2350	5	38.0	124	36x4½	36x4½	168
Kisselkar, 50	Fore-door semi-touring	2350	5	"	"	"	"	"
Kisselkar, 50	Fore-door racer	2350	2	"	"	"	"	"
Lenox	Limousine	2750	7	27.3	116	34x4	34x4	186
Lexington, F	Coupe	2500	3	32.4	122	36x4	36x4	188
Marmon, 32	Touring	2750	5	32.4	120	35x4½	35x4½	205
Marmon, 32	Suburban	2750	4	"	"	"	"	"
Marmon, 32	Roadster	2750	2	"	"	"	"	"
McFarlan, 40-45	Fore-door touring	2100	5	38.4	124	36x4	36x4	214
McFarlan, 40-45	Torpedo	2100	4	"	"	"	"	"
McFarlan, 55-60	Torpedo	2750	4	48.6	128	37x4½	37x4½	215
McFarlan, 55-60	Fore-door touring	2750	7	"	"	"	"	"
Mercer, 35R	Raceabout	2500	2	30.6	108	32x4	32x4	217
Mercer, 35-R	Runabout	2500	2	"	"	"	"	"
Mercer, 35-A	Fore-door touring	2750	4	32.4	118	34x4	34x4	218
Mercer, 35-A	Fore-door touring	2750	5	"	"	"	"	"
Midland, L3	Fore-door touring	2000	5	32.4	115	34x4	34x4	220
Midland, L3	Toy tonneau	2000	4	32.4	115	34x4	34x4	220
Midland, R	Fore-door touring	2750	5	32.4	118	35x4½	35x4½	221
Mitchell, 7-6	Fore-door touring	2250	7	48.6	135	36x4½	36x4½	226
Moon, 30	Limousine	2750	7	32.4	115	34x4	34x4	229
Moon, 40	Coupe	2250	4	32.4	120	36x4	36x4	230
National, Series V	Fore-door touring	2900	5	38.0	128	36x4½	36x4½	371
National, Series V	Fore-door toy tonneau	2900	4	"	"	"	"	"
National, Series V	Roadster	2700	2	"	120	34x4½	34x4½	372
National, Roadster	Roadster	2500	2	40.0	124	36x4	36x4	234
National, Touring	Touring	2600	5	"	"	"	"	235
Oakland, 45	Touring	2100	7	32.4	120	36x4½	36x4½	239
Ohio, Regular	Torpedo	2500	5	32.4	115	36x4	36x4	241
Ohio, Regular	Fore-door touring	2500	5	"	"	"	"	"
Ohio, Regular	Roadster	2500	2	"	"	"	"	"
Ohio, Regular	Coupe	2750	4	"	"	"	"	"
Ohio, Regular	Close coupled	2250	4	"	"	"	"	"
Ohio, Regular	Speedster	2250	2	39.0	105	32x4	32x4	242
Otto	Touring	2000	5	28.9	123	34x3½	34x3½	247
Otto	Torpedo	2000	4	"	"	"	"	"
Otto	Roadster	2000	2	"	"	"	"	"
Otto	Coupe	2850	3	"	"	"	"	"
Overland, 61	Torpedo roadster	2000	3	30.6	118	34x4	34x4	251
Overland, 61	Coupe	2000	3	"	"	"	"	"
Palmer-Singer, 6-40	Touring	2000	5	38.4	126	34x4	34x4	261
Palmer, Singer, 6-40	Touring	2000	4	"	"	"	"	"
Palmer-Singer, 6-40	Runabout	2000	2	"	"	"	"	"
Palmer-Singer, 46	Touring	2700	7	"	"	36x4	36x4½	262
Palmer-Singer, 46	Touring	2500	5	"	"	"	"	"
Palmer-Singer, 46	Runabout	2500	2	"	"	"	"	"
Pathfinder, 40	Coupe	2250	4	27.2	118	34x	34x	266
Pratt, 40	Demi-tonneau	2000	4	32.4	120	36x4	36x4	286

as in the majority of the European countries. Although there are many hills abroad, the roads generally are so good that the grade seems minimized. The worm placed beneath the wheel in a rear axle greatly reduces the clearance, too much so for American uses, on anything but city cars. When the worm is placed over the axle the problem of lubrication for starting comes to be a factor, but once the car is moving the wheel picks enough oil up out of the differential bath to adequately care for the worm. Overhead worms have been used by the Dennis company on its trucks for nearly 10 years with the greatest of satisfaction. In touring cars the overhead worm may in some cases interfere with the rear of the body.

Silent Chain Drive for Camshaft Use

Designed To Eradicate Noises Occurring at Low Speeds and to Permit Engine Being Raced Without Unpleasant Secondary Vibration in Car Frame, Which Meets with Approval of Engineers Generally

"BY the use of the silent chain for driving the camshaft the noises occurring at low speeds are entirely eradicated and the slight give in the chain and the truer rotary motion transmitted damp out the vibrations present in the crankshaft and so the engine can be raced up to enormously high speed without giving an unpleasant secondary vibration in the car frame. This is one of the chief advantages for chain drive, as it enables the motor to be run fast on a low gear. It is not merely a question of whether two gears make more noise in the timing gearcase than two chain wheels and a chain, but that there is an added advantage in the chain's power of damping out vibration already present in the motor.

"Light crankshafts have been the cause of many obscure troubles with gear wheels and chain drives to camshafts. The flywheel being at the opposite end of the shaft, any irregularity in the front cylinder may cause the front end of the crankshaft to be accelerated or retarded relative to the flywheel with consequent violent shocks to the timing gears or chains. With the high-grade alloy steels, now used in crankshafts, this twisting without permanent deformation can occur for a long time before the shaft breaks or any other visible evidences can be detected. Meanwhile, however, all of the auxiliary drives to the camshaft, magneto shaft, pump shaft and fan are being blamed for their rapid wear. To substitute a chain for gears in such a case is only a temporary cure, as the chain will eventually be punished by the shocks and will be worn out much sooner and will probably have to bear the blame of being the supposed weak member.

"Silent chains used for driving cam-

There are many engineering problems entering into the use of the worm. The use of the parallel worm, or the hollow type is one to be solved. The best thread angle is another. Although a 45-degree angle is considered best some engineers assert that with a 30-degree angle good results can be obtained and that with the 30-degree angle it is possible to make both the worm and gear much smaller and so reduce the size of the axle casting. Another engineer proves that the efficiency of the worm is largely dependent on the thread angle and also on the lubrication. With the increase of the angle the efficiency rises from a low percentage up to over 90, in fact between 94 and 95 per cent being the maximum.

English Students Air Their Opinions

D. H. Simpson, Connected with Concern Prominent in British Industry Tells Some of the Advantages Gained Through Use of Silent Chain Drive for Camshafts as Has Been Demonstrated to Him

shafts must be provided with some means of adjustment to take up for the stretch in the chain. If chains could be produced of exact constant length and unwearable material and run on wheels equally ideal, drives without adjustment might be expected to give continuous satisfaction; but with the materials at present available and the variations that must be allowed for the non-adjustable chain is not desirable.

"If means are provided for adjusting the chain, so that any slackness due to original variation in length, or to subsequent bedding down or wear, can be removed, it is possible to maintain the chain at correct tension over its whole life. Because means for adjusting the chains are provided it does not mean that they will be frequently required. If the chain is coupled up and run with the engine tests, and then adjusted the drive will be in the position that would be achieved by the use of a chain carefully run in to exact dimensions and fitted on perfect wheels. The chain will then run for many thousands of car miles without attention.

"It is evident in the case of a non-adjustable chain that with a chain of exactly the right length a good drive can be had for a certain length of time, but the same will deteriorate and at an ever increasing rate, as soon as wear begins. When a new chain has to be put on it will be difficult to get one of the correct length, so the second condition may be worse than the first. On the other hand where adjustment has been provided, a much longer life of the chain is assured, and when the chain is worn out it can easily be replaced and the same good working secured with certainty."—D. H. Simpson, of Hans-Renold Chain Co., in Auto-motor Journal.

BUYERS' GUIDE—Continued

$2,500 CLASS—Continued

NAME AND MODEL.	BODY.	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear.	Table No.
Pratt, 40	Touring	2000	5	32.4	120	36x4	36x4	286
Pratt, 40	Touring	2100	7	"	"	"	"	"
Pullman, 4-40	Touring	2150	5	32.4	122	36x4	36x4	290
Pullman, 6-60	Fore-door touring	2750	7	48.6	136	36x4½	36x4½	291
Rambler, Cross Country	Coupe	2500	4	32.4	120	36x4	36x4	292
Rambler, Cross Country	Limousine	2750	5	"	"	36x4½	36x4½	"
Rambler, Country Club	Touring	2250	5	40.0	120	36x4½	36x4½	293
Rambler, Country Club	Toy tonneau	2250	4	"	"	"	"	"
Rambler, Moraine	Touring	2500	7	"	128	40x4½	40x4½	294
Rambler, Moraine	Toy tonneau	2500	6	"	"	"	"	"
Rambler, Metropolitan	Touring	2850	7	"	"	"	"	295
Rambler, Metropolitan	Torpedo	2850	6	"	"	"	"	"
Rayfield, C	Roadster	2500	2	37.2	117	34x—	34x—	296
Rayfield, C	Fore-door	2500	5	"	"	"	"	"
Republic, 111-112-113	Touring	2250	5	28.9	120	36x4	36x4	304
Republic, 111-112-113	Toy tonneau	2250	4	"	"	"	"	"
Republic, 111-112-113	Roadster	2250	2	"	"	"	"	"
Sebring, 6	Torpedo	2750	4	37.2	122	36x4	36x4	316
Selden, 47	Touring	2500	5	36.1	125	36x4	36x4	314
Selden, 47	Touring	2600	7	"	"	"	"	"
Selden, 47	Torpedo	2500	4	"	"	"	"	"
Selden, 47	Roadster	2500	2	"	"	"	"	"
S. G. V., A	Touring	2500	5	22.5	116	34x4	34x4	315
S. G. V., A	Runabout	2500	2	"	"	"	"	"
S. G. V., A	Torpedo	2500	4	"	"	"	"	"
S. G. V., D	Touring	2500	5	25.6	118	"	"	316
S. G. V., D	Runabout	2500	2	"	"	"	"	"
S. G. V., D	Torpedo	2500	4	"	"	"	"	"
Speedwell, 12	Semi-racer	2500	2	40.0	121½	—x4	—x4	325
Speedwell, 12	Torpedo	2700	4	"	"	"	"	"
Speedwell, 12	Semi-racer	2700	4	"	"	"	"	"
Speedwell, 12	Fore-door touring	2750	5	"	"	—x4½	—x4½	"
Speedwell, 12	Fore-door touring	2900	7	"	"	"	"	"
Spoerer, 25-A	Roadster	2000	2	27.2	120	34x4	34x4	326
Spoerer, 25-A	Touring	2000	4	"	"	"	"	"
Spoerer, 25-A	Touring	2000	5	"	"	"	"	"
Spoerer, 25-A	Town car	2500	5	"	"	"	"	"
Spoerer, 40-C	Roadster	2950	2	38.0	"	—x4	—x4½	327
Stafford	Fore-door touring	2350	5	27.2	112	34x4	34x4	328
Stafford	Touring	2250	5	"	"	"	"	"
Staver, 40-F	Fore-door touring	2000	7	32.4	124	36x4	36x4	331
Staver, 40-R-R	Torpedo	2000	4	"	"	"	"	332
Stevens-Duryea, X	Fore-door touring	2850	5	36.1	124	34x4	34x4	335
Stevens-Duryea, X	Touring roadster	2850	4	"	"	"	"	"
Stoddard-Dayton, Stratford	Limousine	2750	7	28.9	114	35x4½	35x4½	339
Stoddard-Dayton, Stratford	Landaulet	2750	7	"	"	"	"	"
Stoddard-Dayton, Stratford	Coupe	2350	3	"	"	"	"	"
Stoddard-Dayton, Saybrook	Touring	2800	7	36.1	122½	36x4½	36x4½	340
Stoddard-Dayton, Saybrook	Torpedo	2700	4	"	"	"	"	"
Stoddard-Dayton, Saybrook	Roadster	2700	2	"	"	"	"	"
Stutz, A	Roadster	2000	2	36.1	120	34x4½	34x4½	344
Stutz, A	Touring	2000	4	"	"	"	"	"
Stutz, A	Touring	2000	5	"	"	"	"	"
Stutz, A	Coupe	2500	4	"	"	"	"	"
Triumph	Roadster	2250	2	28.9	118	36x4	36x4	348
Triumph	Touring	2500	5	"	"	"	"	"
Velie, G	Fore-door touring	2100	5	32.4	115	34x4	34x4	350
Velie, G	Doctor's special	1900	2	"	"	"	"	"
Velie, G	Racytype	2000	2	"	"	"	"	"
Velie, Standard	Touring	2200	5	"	118	36x4	36x4	351
Velie, Standard	Torpedo	2200	4	"	"	"	"	"
Velie, Standard	Roadster	2200	2	"	"	"	"	"
Velie, Special	Touring	2750	6	"	121	36x4½	36x4½	352
Westcott, R	Fore-door touring	2250	7	36.1	120	36x4	36x4	358
W. F. S., B	Touring	2450	5	32.4	118	36x4	36x4	359
W. F. S., B	Gunboat	2500	4	"	"	"	"	"
W. F. S., B	Roadster	2450	3	"	"	"	"	"
W. F. S., B	Roadster	2350	2	"	"	"	"	"
White, G-A-D	Torpedo touring	2250	5	22.5	110	34x4	34x4	360
White, G-A-D	Roadster	2250	2	"	"	"	"	"

$4,000 CLASS

NAME AND MODEL.	BODY.	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear.	Table No
Abbott-Detroit, 44	Limousine	3000	7	27.3	110	36x4	36x4	2
Adams-Farwell, 9	Roadster	3000	2	60.5	128	36x4½	36x4½	3
Alco, 40	Touring	4500	7	44.1	126	36x4	36x5	4
Alco, 40	Toy tonneau	4500	5	"	"	"	"	"
Alco, 40	Runabout	4500	2	"	"	"	"	"
Alco, 40	Limousine	4500	7	"	"	"	"	"
Alco, 40	Landaulet	5500	7	"	"	"	"	"
Alco, 40	Limousine	6000	7	"	"	"	"	"
Alco, 60	Touring	6000	7	54.1	134	"	"	5
Alco, 60	Toy tonneau	6000	5	"	"	"	"	"
Alco, 60	Runabout	6000	2	"	"	"	"	"
Alco, 60	Limousine	6750	7	"	"	"	"	"
Alco, 60	Landaulet	6750	7	"	"	"	"	"
Alco, 60	Limousine	7250	7	"	"	"	"	"
American, Traveler	Fore-door touring	4250	4	46.0	124	40x4	41x4½	10
American, Traveler	Fore-door touring	4500	6	"	140	41x4½	41x4½	11
Amplex, H-K	Roadster	4500	2		128	36x4½	37x5	36
Amplex, H-K	Toy tonneau	4500	5		"	"	"	7
Amplex, H-K	Touring	4500	7		"	"	"	"
Amplex, H-K	Limousine	5650	7		"	"	"	"
Apperson, 4-65	Touring	4200	7	48.4	129	36x4½	37x5	16
Atlas, Knight	Torpedo	3500	4	32.4	130	36x4½	36x4½	369
Atlas, Knight	Touring	3500	5	"	330	36x4½	36x4½	369
Atlas, Knight	Phaeton	3500	6	"	130	"	"	469
Atlas, Knight	Touring	3700	7	32.4	140	37x5	37x5	370
Auburn, 6-50	Fore-door touring	3000	7	40.9	135	37x4½	37x4½	22

BUYERS' GUIDE—Continued

$4,000 CLASS—Continued

NAME AND MODEL.	BODY.	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear.	Table No.
Austin, 45	Touring	3600	5	45.9	126	36x4½	36x4½	23
Austin, 45	Runabout	3600	2	"	"	"	"	"
Austin, 45	Town car	4500	5	"	"	"	"	"
Austin, 45	Limousine	4500	7	"	"	"	"	"
Austin, 50	Touring	4400	5	48.6	135	"	"	24
Austin, 50	Runabout	4400	2	"	"	"	"	"
Austin, 50	Limousine	5500	7	"	"	"	"	"
Austin, 50	Town car	5500	5	"	"	"	"	"
Austin, 77	Touring	6000	5	"	141	37x5	37x5	25
Austin, 77	Limousine	7000	7	"	"	"	"	"
Austin, 77	Runabout	6000	2	"	"	"	"	"
Babcock, F	Touring	3000	7	32.4	120	36x4½	36x4½	28
Babcock, K	Touring	3250	7	36.1	"	"	"	29
Bergdoll, D	Limousine	3000	7	25.6	115	36x4	36x4	31
Bergdoll, D	Landaulet	3100	7	"	"	"	"	"
Berkshire, E	Limousine	3700	7	39.0	124	36x4	36x4½	32
Berkshire, F	Runabout	3750	2	58.5	134	37x5	37x5	33
Berkshire, F	Torpedo	4000	5	"	"	"	"	"
Berkshire, F	Touring	4000	7	"	"	"	"	"
Berkshire, F	Convertible	4500	7	"	"	"	"	"
Berkshire, F	Limousine	5260	7	"	"	"	"	"
Cadillac, 1912	Limousine	3250	7	32.4	116	36x4½	36x4½	39
Carhartt B	Limousine	3100	7	38.0	118	34x4	34x4	45
Case, 40	Limousine	3050	7	32.4	120	36x4	36x4	50
Chadwick, 19	Roadster	5500	2	60.0	112	36x4½	36x4½	51
Chadwick, 19	Touring	5500	7	"	133	"	"	52
Chadwick, 19	Touring about	5500	5	"	"	"	"	"
Chadwick, 19	Limousine	6500	7	"	"	"	"	"
Chadwick, 19	Torpedo	5500	5	"	"	"	"	"
Chalmers, 36	Limousine	3000	7	28.9	115	36x4	36x4	54
Chalmers, 36	Limousine	3250	7	"	"	"	"	"
Chalmers, 12	Touring	3250	7	43.8	130	36x4½	36x4½	55
Chalmers, 12	Fore-door toy tonneau	3250	4	"	"	"	"	"
Colby, H	Limousine	3500	5	27.2	121	36x4	36x4	63
Cole, 1912	Limousine	3000	5	32.4	122	36x4	36x4	65
Cole, 1912	Limousine	3250	5	"	"	"	"	"
Columbia, Cavalier	Runabout	3300	2	38.0	120	36x4	36x4	66
Columbia, Cavalier	Touring	3300	4	"	"	"	"	"
Columbia, Cavalier	Touring	3400	6	"	"	"	"	"
Columbia, Cavalier	Touring	3500	7	"	"	"	"	"
Columbia, Cavalier	Limousine	4800	7	"	"	"	"	"
Columbia, Cavalier	Landaulet	4900	7	"	"	"	"	"
Columbia, Knight	Runabout	4500	2	"	129	36x4½	36x4½	67
Columbia, Knight	Touring	4500	4	"	"	"	"	"
Columbia, Knight	Touring	4500	6	"	"	"	"	"
Columbia, Knight	Touring	4500	7	"	"	"	"	"
Columbia, Knight	Limousine	5800	7	"	"	"	"	"
Columbia, Knight	Landaulet	5800	7	"	"	"	"	"
Corbin, 40	Touring	3000	5	36.1	120	36x4	36x4	70
Corbin, 40	Touring	3050	7	"	"	"	"	"
Corbin, 40	Toy tonneau	3000	4	"	"	"	"	"
Corbin, 40	Torpedo	3100	4	"	"	"	"	"
Corbin, 40	Limousine	4000	7	"	"	37x4½	37x4½	"
Cunningham, J	Limousine	4500	7	36.1	124	—x4½	—x4½	82
Cunningham, J	Runabout	3250	3	"	"	"	"	"
Cunningham, J	Torpedo	3500	4	"	"	"	"	"
Cunningham, J	Touring	3500	7	"	"	"	"	"
Cunningham, J	Phaeton	3500	5	"	"	"	"	"
Cunningham, J	Landaulet	4500	7	"	"	"	"	"
Dorris, G	Limousine	3600	7	30.6	115	36x4	36x4	91
Fiat, 4	Runabout	4500	2	31.3	123	36x4½	36x4½	101A
Fiat, 4	Phaeton		5	"	"	"	"	"
Fiat, 4	Touring	4500	7	"	"	"	"	"
Fiat, 4	Limousine		7	"	"	"	"	"
Fiat, 4	Landaulet		7	"	"	"	"	"
Fiat, 6	Runabout	5500	2	47.0	135	36x4½	37x5	101B
Fiat, 6	Phaeton		5	"	"	"	"	"
Fiat, 6	Touring	5500	7	"	"	"	"	"
Fiat, 6	Limousine		7	"	"	"	"	"
Fiat, 6	Landaulet		7	"	"	"	"	"
Four-Wheel Drive, A	Fore-door touring	4500	7	36.1	134	36x4½	36x4½	108
Four-Wheel Drive, A	Runabout	4500	2	"	"	"	"	"
Four-Wheel Drive, A	Limousine	4500	5	"	"	"	"	"
Four-Wheel Drive, A	Roadster	4500	2	"	"	"	"	"
Franklin, 25	Limousine	3000	7	25.6	108	34x4	34x4½	111
Franklin, 25	Landaulet	3000	7	25.6	108	34x4	34x4½	111
Franklin, D	Touring	3500	5	38.4	123	36x4½	37x5	113
Franklin, D	Torpedo phaeton	3500	4	"	"	"	"	"
Franklin, H	Touring	4000	7	"	126	"	"	114
Franklin, H	Limousine	5000	7	"	"	"	"	"
Frontenac, E	Touring	3500	7	36.1	123	34x4	34x4½	115
Garford, G-12	Touring		5	28.9	119	34x4½	34x4½	116
Garford, G-8	Limousine		7	36.1	"	36x4½	36x4½	117
Garford, G-14	Touring		7	43.8	138½	"	37x5	118
Garford, G-14	Limousine		7	"	"	"	"	"
Great Eagle, 4-50	Fore-door touring	3850	5	36.1	135	36x—	36x—	122
Great Eagle, 4-50	Limousine	4000	7	"	"	"	"	"
Great Eagle, 4-50	Landaulet	4000	7	"	"	"	"	"
Great Eagle, 4-50	Fore-door limousine	4500	7	"	"	"	"	"
Great Eagle, 6-60	Fore-door touring	4250	7	40.9	138	36x4½	37x5	123
Haynes, Y	Touring	3000	7	40.0	127½	36x4½	37x5	135
Haynes, Y	Close coupled	3000	4	"	"	"	"	"
Haynes, Y	Limousine	3800	7	"	"	"	"	"
Haynes, Y	Limousine	3900	7	"	"	"	"	"
Inter-State, 50	Fore-door touring	3400	7	40.0	124	36x4½	36x4½	152
Inter-State, 51	Demi-tonneau	3400	4	"	"	"	"	"
Inter-State, 52	Roadster	3400	2	"	"	"	"	"
Johnson, B	Limousine	3500	5	32.4	112	36x4	36x4	159
Johnson, C	Fore-door touring	3100	7	40.0	124	36x4½	36x4½	160
Johnson, C	Touring	3000	7	"	"	"	"	"
Johnson, C	Limousine	4000	7	"	"	"	"	"

More on the Use of Silent-Chain Drive

A. S. Hill, of Coventry, Declares It Is Possible To Make a Chain for Camshaft Drive that Will Give Entire Satisfaction Without the Adjustment Feature—Other Claims Made

"I HAVE no knowledge of a chain showing any appreciable signs of wear, if the drive has been properly designed and the chains suitably refined before being fitted to the engine, even after running 6,000 miles. In a word I think it is possible to make a chain for camshaft drive that will give entire satisfaction without the adjustment feature. Accuracy in manufacture depends to what extent the manufacturing processes are carried by the chain makers. When a chain first forms a complete assembly it is not dead to reputed measure in its oversall length, for the reason that the total tolerance, or allowed error, is the average tolerance on each pitch multiplied by the total number of pitches in the chain. This error in one pitch may be as low as .00025 inch but the total tolerance in any chain of considerable length will be perceptible. The integral parts of a silent chain are made to a standard of accuracy higher than that accepted in good motor car practice.

"Although the mere assembly of a number of links fastened together undoubtedly constitutes a chain, and is sold for such in innumerable purposes in all branches of general engineering, it does not necessarily follow that where special chains for particular purposes are required, a great deal more work and extra refinement may not be to great advantage. I maintain that a finished chain, as ordinarily understood, can be refined in accuracy by further processes in order to render it serviceable to the special requirements of the motor car engineer.

"To fit an adjustment on every engine without refining the chain, for the sake of taking up the sag in its own individual chain is an unnecessarily expensive proceeding, when all chains can be separately run in to length on one adjustable jig,

Long-Stroke Motor and Its Advantages

John Wilkinson, Franklin Engineer, Goes into the Proposition and Discusses it From His Viewpoint—Tells of Tests Made by Three of the English Associations and Clubs

THE long-stroke motor came into prominence abroad on account of the classification of motors for racing purposes and also on account of the horsepower tax, which tax was paid according to the horsepower, based on a formula which considered the cylinder bore only and left the stroke out of consideration.

If two engines of equal power, one with a short and the other with a long stroke, are

Good Advice Given To the Engineers

Accept Experience of Chain Makers as to Widths and Pitches of Chains and Use Utmost Accuracy in Setting Centers for the Chain Wheels, Says the Expert in Great Britain

especially made for the purpose. Dispositions of camshaft drives are numerous and an argument for adjustment on one disposition may not be applicable to another. In drives where two wheels only are employed fixed centers are always specified by car engineer. In another disposition employing one chain as a triangular drive over three wheels an adjustment is essential because a much longer chain must be used and the wear is more rapid by reason of the smaller arc of contact between each of the three wheels and the chain. An adjustment is also useful to decrease the flapping of the free portion of the chain due to the intermittent load of the camshaft and also the magneto.

"In arranging for chain drive for camshafts and magneto shafts motor car engineers should have regard to the following points: Accept the experience of chain makers in determining suitable widths and pitches of chains; and use the utmost accuracy in setting the centers for the chain wheels. Any inaccuracy of chain wheel centers frustrates the object of the refining processes in chain manufacture and cannot possibly be corrected after the chain has been fitted.

"There is one other point of great interest where chain drives are concerned and for which some provision for adjustment must always be made. It is the question of end float or end movement in the crankshaft, camshaft and magneto shafts. This is a question for the motor car engineer and not for the chain maker. It is obvious that if chain wheels are permitted to float fore and aft on their shafts troubles of cutting guide plates and mounting of teeth are likely to occur."—A. S. Hill, Coventry Chain Co. From Automotor Journal of Great Britain.

Weighs Pros and Cons of Popular Engine

Slower the Rotative Speed the Greater the Motor, Is Claim of American Designer Who Probes into Mechanical Features of a Type that Is Growing in Favor in This Country

considered for a car, it should mean in the case of the long stroke a lower rotative speed, higher piston speed and a greater torque; with the short stroke, a higher rotative speed, a lower piston speed and a lower torque. The relations of piston speed have been well defined by the tests and conclusions of the norsepower formula committee representing the Incorporated Institution of Automobile Engineers of England, the Royal Automobile

BUYERS' GUIDE—Continued

$4,000 CLASS—Continued

NAME AND MODEL.	BODY.	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear	Table No.
Johnson, C	Fore-door limousine	4500	7	40.0	124	36x4½	36x4½	160
Jons, D	Brougham	3100	5	32.4	120	36x4	36x4	163
Kisselkar, 60	Fore-door touring	3000	7	48.6	132	37x5	37x5	169
Kisselkar, 60	Semi-touring	3000	5	"	"	"	"	"
Kisselkar, 60	Semi-racer	3000	2	"	"	"	"	"
Klinekar, 4-40	Roadster	2200	2	28.9	118	36x4	36x4	171
Klinekar, 4-40	Touring	2250	5	"	"	"	"	"
Klinekar, 4-40	Toy tonneau	2250	4	"	"	"	"	"
Klinekar, 6-50	Touring	2850	5	40.0	126	36x4½	36x4½	172
Klinekar, 6-50	Toy tonneau	2850	4	"	"	"	"	"
Klinekar, 6-50	Meteor	2850	2	"	"	"	"	"
Klinekar, 6-60	Touring	3200	7	43.8	130	38x4½	38x4½	173
Klinekar, 6-60	Touring	3200	6	"	"	"	"	"
Klinekar, 6-60	Toy tonneau	3200	4	"	"	"	"	"
Klinekar, 6-60	Meteor	3200	2	"	"	"	"	"
Knox, R	Torpedo	3450	4	40.0	117	36x4½	36x4½	174
Knox, R	Raceabout	3300	4	"	"	"	"	"
Knox, R	Raceabout	3200	2	"	"	"	"	"
Knox, R	Toy tonneau	3500	5	"	122	"	"	175
Knox, R	Limousine	4250	7	"	"	"	"	"
Knox, R-45	Toy tonneau	3800	7	"	126	37x5	37x5	176
Knox, R-45	Limousine	4700	7	"	"	"	"	"
Knox, R-45	Torpedo	3700	6	"	"	"	"	"
Knox, R-45	Raceabout	3600	2	"	"	"	"	"
Knox, S	Raceabout	4800	4	60.0	134	38x5½	38x5½	177
Knox, S	Tonneauette	4900	5	"	"	"	"	"
Knox, S	Toy tonneau	5000	7	"	"	"	"	"
Knox, S	Torpedo	5000	6	"	"	"	"	"
Knox, S	Limousine	6400	7	"	"	"	"	"
Locomobile, L-4	Touring	3500	5	32.4	120	34x4½	34x4½	190
Locomobile, L-4	Toy tonneau	3500	4	"	"	"	"	"
Locomobile, L-4	Torpedo	3700	4	"	"	"	"	"
Locomobile, L-4	Limousine	4600	7	"	"	"	"	"
Locomobile, L-4	Landaulet	4700	6	"	"	"	"	"
Locomobile, M-2	Touring	4800	7	48.6	135	36x4	37x5	191
Locomobile, M-2	Landaulet	6150	6	"	"	"	"	"
Locomobile, M-2	Torpedo	4800	4	"	"	"	"	"
Locomobile, M-2	Torpedo	4800	5	"	"	"	"	"
Locomobile, Little 6	Torpedo	4200	4	43.8	128	36x4½	36x4½	191A
Locomobile, Little 6	Touring	4200	5	"	"	"	"	"
Locomobile, Little 6	Limousine	5550	.....	"	"	"	"	"
Locomobile, Little 6	Landaulet	5650	.....	"	"	"	"	"
Lozier, 46	Lakewood	4700	5	46.0	124	36x4	36x5	192
Lozier, 46	Briercliff	4700	5	"	"	"	"	"
Lozier, 46	Riverside	4700	7	"	"	"	"	"
Lozier, 46	Limousine	6200	7	"	"	"	"	"
Lozier, 46	Landaulet	6200	5	"	"	"	"	"
Lozier, 51	Lakewood	5000	5	34.2	131	"	"	193
Lozier, 51	Briercliff	5000	5	"	"	"	"	"
Lozier, 51	Riverside	5000	7	"	"	"	"	"
Lozier, 51	Limousine	6500	7	"	"	"	"	"
Lozier, 51	Landaulet	6500	5	"	"	"	"	"
Luverne, 750	Touring	3000	5	36.1	128	36x4½	36x4½	195
Marathon, N-50	Limousine	3250	7	32.4	121	37x4½	37x4½	201
Marmon, 32	Limousine	4000	7	32.4	120	35x4½	35x4½	205
Marmon, 32	Landaulet	4100	7	"	"	"	"	"
Marmon, 6	.....	.....	.....	.....	.....	.....	.....	205A
Marquette, 22	Roadster	3000	2	40.0	122	36x4	36x4½	206
Marquette, 24	Tourabout	3000	4	"	"	"	"	"
Marquette, 25	Touring	3000	5	"	"	"	"	"
Marquette, 27	Touring	3000	7	"	"	"	"	"
Marquette, 27	Limousine	3500	7	"	"	"	"	"
Marquette, 28	Touring	4000	7	"	119	36x4½	"	207
Marquette, 28	Limousine	4500	7	"	"	"	"	"
Matheson, 50	Touring	3500	5	48.6	125½	36x4	36x4½	208
Matheson, 50	Fore-door	3750	5	"	"	"	"	"
Matheson, 50	Fore-door touring	4000	7	"	"	"	"	"
Matheson, 50	Toy tonneau	3500	4	"	"	"	"	"
Matheson, 50	Speedster	3500	2	"	"	"	"	"
Matheson, 50	Touring	4000	7	"	135	"	"	209
Matheson, 50	Limousine	6700	7	"	"	"	"	"
Matheson, 50	Limousine	6000	6	"	"	"	"	"
Matheson, 50	Demi-limousine	6500	7	"	"	"	"	"
Matheson, 50	Town car	4700	6	"	"	"	"	"
Mercer, 35-A-B	Limousine	3750	7	32.4	118	34x4	34x4	218
Midland, R	Coupe	3000	3	32.4	118	35x4½	35x4½	221
Midland, O	Roadster	3000	2	45.5	"	"	"	222
Mitchell, 5-6 and 2-6	Limousine	3000	5	33.7	125	36x4	36x4	225
Moon, 40	Limousine	3000	7	32.4	120	36x4	36x4	230
Moon, 40	Limousine	3200	5	"	"	"	"	"
Moon, 45	Touring	3000	7	36.1	123	"	36x4½	231
Moon, 45	Torpedo	3100	4	"	"	"	"	"
Moon, 45	Raceabout	3000	2	"	"	"	"	"
Moon, 45	Limousine	4800	7	"	"	"	"	"
Morse, D	Touring	4200	7	34.2	127	36x4½	37x5	232
Morse, D	Touring	4200	5	"	"	"	"	"
Morse, D	Torpedo	4200	4	"	"	"	"	"
National, Touring	Touring	3000	7	40.0	124	36x4	36x4	235
National, Series V	Fore-door touring	3000	7	38.0	128	36x5	36x5	371
Oakland, 45	Limousine	3000	7	32.4	120	36x4½	36x4½	239
Octoauto	Fore-door—8 wheels	3200	4	30.6	175	34x3½	34x4	240
Octoauto	Fore-door, —8 wheels	3200	5	"	"	"	"	"
Ohio, Regular	Limousine	3350	7	32.4	115	36x4	36x4	241
Oldsmobile, Defender	Touring	3000	5	25.6	116	36x4	36x4	243
Oldsmobile, Defender	Tourabout	3000	4	"	"	"	"	"
Oldsmoblie, Defender	Roadster	3000	2	"	"	"	"	"
Oldsmobile, Defender	Coupe	3600	3	"	"	34x4½	34x4½	"
Oldsmobile, Autocrat	Touring	3500	7	40.0	126	39x5	39x5	244
Oldsmobile, Autocrat	Limousine	4700	7	"	"	"	"	"
Oldsmobile, Autocrat	Tourabout	3500	4	"	"	38x4½	38x4½	"
Oldsmobile, Autocrat	Roadster	3500	2	"	"	"	"	"

BUYERS' GUIDE—Continued

$4,000 CLASS—Continued

NAME AND MODEL.	BODY.	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear.	Table No.
Oldsmobile, Limited.	Tourabout	5000	4	60.0	140	42x4½	42x4½	245
Oldsmobile, Limited.	Roadster	5000	2	"	"	"	"	"
Oldsmobile, Limited.	Touring	5000	7	"	"	43x5	43x5	"
Oldsmobile, Limited.	Limousine	6300	7	"	"	"	"	"
Otto	Limousine	3250	5	28.9	123	34x3½	34x3½	247
Otto	Landaulet	3250	5	"	"	"	"	"
Otto	Fore-door limousine	3250	4	"	"	"	"	"
Packard, 18 Runabout	Runabout	3200	2	36.4	108	34x4	34x4	252
Packard, 18 Standard	Touring	3200	5	"	112	"	"	253
Packard, 18 Standard	Runabout	3200	2	"	"	"	"	"
Packard, 18 Standard	Coupe	3900	2	"	"	"	"	"
Packard, 18 Standard	Limousine	4400	5	"	"	"	"	"
Packard, 18 Standard	Landaulet	4500	5	"	"	"	"	"
Packard, 18 Standard	Imperial limousine	4600	5	"	"	"	"	"
Packard, 18 Standard	Imperial landaulet	4700	5	"	"	"	"	"
Packard, 30 Runabout	Runabout	4200	2	40.0	114	36x4½	37x5	254
Packard, 30 Standard	Touring	4200	7	"	123½	"	"	255
Packard, 30 Standard	Close coupled	4200	5	"	"	"	"	"
Packard, 30 Standard	Coupe	4900	2	"	"	"	"	"
Packard, 30 Standard	Limousine	5450	7	"	"	"	"	"
Packard, 30 Standard	Brougham	5500	5	"	"	"	"	"
Packard, 30 Standard	Landaulet	5550	7	"	"	"	"	"
Packard, 30 Standard	Imperial limousine	5650	7	"	"	"	"	"
Packard, 30 Standard	Imperial landaulet	5750	7	"	"	"	"	"
Packard, 30 Phaeton	Phaeton	4200	5	"	129½	"	"	256
Packard, 6 Runabout	Runabout	5000	2	48.6	121½	"	"	257
Packard, 6 Standard	Touring	5000	7	"	133	"	"	258
Packard, 6 Standard	Close coupled	5000	5	"	"	"	"	"
Packard, 6 Standard	Coupe	5700	2	"	"	"	"	"
Packard, 6 Standard	Limousine	6250	7	"	"	"	"	"
Packard, 6 Standard	Brougham	6300	5	"	"	"	"	"
Packard, 6 Standard	Landaulet	6350	7	"	"	"	"	"
Packard, 6 Standard	Imperial limousine	6450	7	"	"	"	"	"
Packard, 6 Standard	Imperial landaulet	6500	7	"	"	"	"	"
Packard, 6 Phaeton	Phaeton	5000	5	"	139	"	"	259
Palmer-Singer, 46	Limousine	4150	7	38.4	126	36x4	36x4½	262
Palmer-Singer, 46	Landaulet	4250	7	"	"	"	"	"
Palmer-Singer, 6-60	Touring	3000	5	57.0	138	"	36x5	263
Palmer-Singer, 6-60	Touring	3600	7	"	"	"	"	"
Palmer-Singer, 6-60	Runabout	3000	2	"	"	"	"	"
Palmer-Singer, 6-60	Limousine	4500	7	"	"	"	"	"
Palmer-Singer, 6-60	Landaulet	4600	7	"	"	"	"	"
Peerless, D	Limousine	4200	4	25.6	113	34x4½	34x4½	267
Peerless, D	Landaulet	4300	4	"	"	"	"	"
Peerless, J	Touring	4000	3	38.4	125	36x4½	36x4½	268
Peerless, J	Torpedo	4000	2	"	"	"	"	"
Peerless, J	Roadster	4000	2	"	"	"	"	"
Peerless, J	Limousine	5000	4	"	"	"	"	"
Peerless, J	Landaulet	5100	4	"	"	"	"	"
Peerless, J	Berline	5200	4	"	"	"	"	"
Peerless, H	Touring	4300	4	40.0	124½	"	37x5	269
Peerless, H	Torpedo	4800	4	"	"	"	"	"
Peerless, H	Phaeton	4300	4	"	"	"	"	"
Peerless, H	Limousine	5300	4	"	"	"	"	"
Peerless, H	Berline	5500	4	"	"	"	"	"
Peerless, H	Landaulet	5400	4	"	"	"	"	"
Peerless, K	Touring	5000	4	48.6	137	"	"	270
Peerless, K	Phaeton	5000	3	"	"	"	"	"
Peerless, K	Torpedo	5000	4	"	"	"	"	"
Peerless, K	Landaulet	6100	4	84.6	"	"	"	"
Peerless, K	Limousine	6000	4	"	"	"	"	"
Peerless, K	Berline	6200	4	"	"	"	"	"
Peerless, L	Touring	6000	4	60.0	140	37x5	38x5½	271
Peerless, L	Torpedo	6000	4	"	"	"	"	"
Peerless, L	Phaeton	6000	3	"	"	"	"	"
Peerless, L	Limousine	7000	4	"	"	"	"	"
Peerless, L	Landaulet	7100	4	"	"	"	"	"
Peerless, L	Berline	7200	4	"	"	"	"	"
Pierce-Arrow, 36-R	Runabout	4000	3	38.4	119	36x4½	36x4½	277
Pierce-Arrow, 36-T	Touring	4000	4	"	127½	"	"	278
Pierce-Arrow, 36-T	Touring	4000	5	"	"	"	"	"
Pierce-Arrow, 36-T	Brougham	4900	5	"	"	"	"	"
Pierce-Arrow, 36-T	Landaulet	4900	5	"	"	"	"	"
Pierce-Arrow, 48-R	Runabout	4850	3	48.6	128	"	"	279
Pierce-Arrow, 48-T	Touring	4850	4	"	134½	37x5	37x5	280
Pierce-Arrow, 48-T	Touring	4850	5	48.6	134½	37x5	37x5	280
Pierce-Arrow, 48-T	Touring	5000	7	"	"	"	"	"
Pierce-Arrow, 48-T	Brougham	5750	5	"	"	"	"	"
Pierce-Arrow, 48-T	Landaulet	5750	5	"	"	"	"	"
Pierce-Arrow, 48-T	Landaulet	6100	7	"	"	"	"	"
Pierce-Arrow, 48-T	Suburban	6100	7	"	"	"	"	"
Pierce-Arrow, 48-T	Vestibule suburban	6450	7	"	"	"	"	"
Pierce-Arrow, 66-R	Runabout	5850	2	60.0	133½	"	"	281
Pierce-Arrow, 66-T	Touring	5850	4	"	140	"	38x5½	282
Pierce-Arrow, 66-T	Touring	5850	5	"	"	"	"	"
Pierce-Arrow, 66-T	Touring	6000	7	"	"	"	"	"
Pierce-Arrow, 66-T	Brougham	6750	5	"	"	"	"	"
Pierce-Arrow, 66-T	Landaulet	6750	5	"	"	"	"	"
Pierce-Arrow, 66-T	Landaulet	7100	7	"	"	"	"	"
Pierce-Arrow, 66-T	Suburban	7100	7	"	"	"	"	"
Pierce-Arrow, 66-T	Vestibule suburban	7450	7	"	"	"	"	"
Pope-Hartford, 27	Touring	3000	5	36.1	124	36x4½	36x4½	284
Pope-Hartford, 27	Phaeton	3000	5	"	"	"	"	"
Pope-Hartford, 27	Toy tonneau	3000	4	"	"	"	"	"
Pope-Hartford, 27	Roadster	3000	2	"	"	"	"	"
Pope-Hartford, 27	Touring	3250	7	"	"	"	"	"
Pope-Hartford, 27	Limousine	4150	7	"	"	"	"	"
Pope-Hartford, 27	Landaulet	4150	7	"	"	"	"	"
Pope-Hartford, 27	Berline	4400	7	"	"	"	"	"
Pope-Hartford, 28	Touring	4000	7	44.6	134	38x4½	39x5	285
Pope-Hartford, 28	Phaeton	4000	5	"	"	"	"	"

Club and the Society of Motor Manufacturers and Traders. This committee tested some 144 engines, 101 of the tests comparing the effect of stroke-bore ratio for values of ratio from 1 to 1.61. Their conclusion is represented by the equation:

$A = 600\ (r + 1)$ feet per minute where R = ratio of stroke to bore.

This implies a maximum practicable piston speed of 1,200 feet per minute for $R = 1$, rising to 2,100 feet per minute for $R = 2.5$. This gives the required relation to compare engines of equal power but of different stroke-bore ratio.

Take 4 by 4, or a 1 to 1 ratio, as a short-stroke engine; and $R = 1\frac{1}{2}$ and $R = 2$ for the medium and long-stroke engines. The relations of piston speed in the three motors will be 1,200, 1,500 and 1,800. Now, getting the sizes from these figures and considering mean effective pressures the same the sizes of our three engines will be:

Bore and stroke	Piston speed, feet	R.P.M.
4 by 4	1200	1800
3.58 by 5.37	1500	1666
3.27 by 6.54	1800	1651

Now these engines placed in the same chasses and geared so that at any speed of the car the relative piston speeds are 1,200 and 1,500 and 1,800 feet per minute will all give practically the same power.

Consider the qualities of these motors as regards economy, cost, weight, quietness, life, vibration and other points. In regard to economy, I refer again to the report already mentioned and find that it was deduced from the results obtained that the mean effective pressure is in general a function of the bore and that it increases slightly with the bore. The M. E. P. of the three should be as follows:

4 by 4 = 91 pounds
3.58 by 5.37 = 87 pounds
3.27 by 6.54 = 83 pounds

The comparison of sizes was made on the basis of the same M. E. P., while the deduction from the tests shows this to be about 10 per cent less for the 3.37 by 6.54 motor. It is unfortunate that in these results M. E. P. is only considered at or near the maximum horsepower and not all along the horsepower curves at various points, so that while it reasonably shows the economy of the 4 by 4 to be greater at or near its maximum power, it gives us no data on the economy under other running conditions.

I regret that no such data has been available so that this question has to be left open, although the only evidence leans toward the short-stroke engine as the most economical. As regards the weight, I believe as a matter of theory and backed up by my own practice in the case of sizes of engines of 3¼, 4 by 4, 4¼ by 4, 4½ by 4, 4½ by 4½, 4 by 5, 3⅝ by 4, and 3 by 5 that the relative weight, not including flywheel, will be according to the cubic dimensions of the motor. The strength and weight of clutch, gearset and drive shaft will vary according to the torque of the motor and will therefore be greater with the long-stroke engine. This leaves the weight question considerably in favor of the 4 by 4, with the additional saving of the flywheel. The cost will go with the weight.

Another curious thing about the comparison which cannot be lost sight of is that the 4 by 4 engine, with the 10 per cent greater M. E. P., actually gives more horsepower at the same number of revolutions than the 3.27 by 6.54. Therefore, if the conclusions of the committee were right, the question of weight and cost are certainly settled, and while it may be that a long-stroke, high-strung English motor built in 1911 is lighter than a short-stroke motor of older date, it is certain that with the same factors of safety, materials and intelligence of design the short-stroke motor will be considerably lighter and cheaper.

If I were to take up the question of efficiency from the theoretical side I should consider the relation of compression to piston speed, the effect of piston speed itself and the relation of the exposed surface to the volume of charge. The higher the piston speed the more temperature the motor can stand without ill effects, such as pre-ignition and pounding, and therefore it might seem that higher compression could be used, but this is opposed by the fact that the higher the piston speed the more heat the motor has to stand and therefore the increase in compression allowable must be very limited at best and perhaps not possible at all.

Compressions being equal, the thermal efficiency should be proportional to $\frac{V}{S\,T}$

where V = volume of charge. S = exposed charge and T = time of exposure.

Of course, this only takes into consideration the loss of heat into walls and could only be used in comparison to obtain which engine might be more efficient. The long-stroke motor has a greater ratio of exposed surface and longer time of exposure, so that unless it can use higher compression it will be less economical.

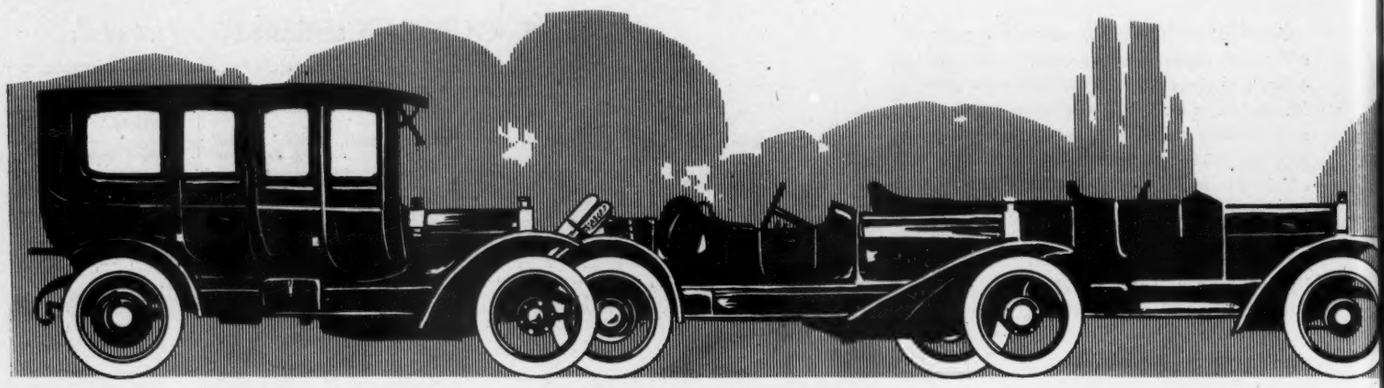
I think that most everyone will admit that the slower the rotative speed the quieter the motor and that, based on the assumption of equal mean effective pressures, the long-stroke will be the quieter, but based on the formula of the committee, the quietness should be equal.

As to the minor question of vibration, it would probably have an equal effect on either motor if piston speeds were proportioned theoretically correct, but most of the long-stroke motors are of later design, with abnormal piston speeds and very light pistons, so that comparisons are difficult. In its relation to special types it is easy to see that the long-stroke motor fills in with the block cylinder design with two crankshaft bearings on account of shorter distance between bearings and lessened thrust on the crankshaft. It is also easy to see that as the ratio of stroke to bore becomes more than 1 to 1½ exaggerations of designs begin to creep in such as too short connecting rods, too large valve pockets in relation to cylinder size, inclined valve stems and guides, extra high engines, slots on cylinder sides to take the swing of the connecting rods, etc.—John Wilkinson, H. H. Franklin Co.

BUYERS' GUIDE—Continued

$4,000 CLASS—Continued

NAME AND MODEL.	BODY	Price.	Seats.	H. P. S. A. E.	Wheel Base.	TIRES. Front.	TIRES. Rear.	Table No.
Pope-Hartford, 28	Toy tonneau	4000	4	44.6	134	38x4½	39x5	285
Pope-Hartford, 28	Roadster	4000	2	"	"	"	"	"
Pope-Hartford, 28	Limousine	5150	7	"	"	"	"	"
Pope-Hartford, 28	Landaulet	5150	7	"	"	"	"	"
Pope-Hartford, 28	Berline	5400	7	"	"	"	"	"
Premier, M-4	Touring	3000	5	32.4	126	36x4½	36x4½	287
Premier, M-4	Roadster	3000	2	"	"	"	"	"
Premier, M-4	Clubman	3000	5	"	"	"	"	"
Premier, M-4	Limousine	4200	7	"	"	"	"	"
Premier, M-4	Berline	5200	7	"	"	"	"	"
Premier, M-6	Touring	3750	7	48.6	140	"	"	288
Premier, M-6	Clubman	3750	5	"	"	"	"	"
Premier, M-6	Roadster	3750	2	"	"	"	"	"
Premier, M-6	Limousine	5000	7	"	"	"	"	"
Premier, M-6	Berline	6000	7	"	"	"	"	"
Rambler, Metropolitan	Limousine	4200	7	60.0	128	40x4½	40x4½	295
Schlosser, 1912	Touring	4500	7	60.0	126	36x4½	36x4½	312
Schlosser, 1912	Runabout	4200	5	"	"	"	"	"
Schlosser, 1912	Limousine	5400	7	"	"	"	"	"
Selden, 47	Limousine	3750	7	36.1	125	36x4	36x4	314
S. G. V., A	Landaulet	3500	6	22.5	116	34x4	34x4	315
S. G. V., A	Limousine	3500	6	"	"	"	"	"
S. G. V., D	Landaulet	3500	6	25.6	118	"	"	316
S. G. V., D	Limousine	3500	6	"	"	"	"	"
Simplex, 38	Touring	4850	4	57.0	127	36x4	36x5	318
Simplex, 38	Touring	4850	5	"	"	"	"	"
Simplex, 38	Touring	4850	7	"	"	"	"	"
Simplex, 38	Limousine	5800	7	"	"	"	"	"
Simplex, 38	Landaulet	5800	7	"	"	"	"	"
Simplex, 38	Touring	5700	7	38.0	137	34x4½	34x5	319
Simplex, 38	Coach limousine	6500	7	"	"	"	"	"
Simplex, 38	Coach landaulet	6500	7	"	"	"	"	"
Simplex, 38	Fore-door touring	5850	7	"	"	"	"	"
Simplex, 38	Fore-door limousine	6700	7	"	"	"	"	"
Simplex, 38	Fore-door landaulet	6700	7	"	"	"	"	"
Simplex, 50	Touring	5600	5	53.0	124	36x4	36x5	320
Simplex, 50	Touring	5700	7	"	"	"	"	"
Simplex, 50	Touring	5600	4	"	"	"	"	"
Simplex, 50	Runabout	5300	2	"	"	"	"	"
Simplex, 50	Toy tonneau	5400	4	"	"	"	"	"
Simplex, 50	Limousine	6400	7	"	129	"	"	321
Simplex, 50	Landaulet	6400	7	"	"	"	"	"
Simplex, 50	Touring	6200	7	"	139	36x5	"	322
Simplex, 50	Fore-door touring	6350	7	"	"	"	"	"
Spoerer, 40-C	Fore-door touring	3000	5	38.0	120	—x4	—x4½	327
Spoerer, 40-C	Fore-door touring	3250	7	"	"	"	"	"
Spoerer, 40-C	Limousine	4000	7	"	"	"	"	"
Spoerer, 40-C	Landaulet	4150	7	"	"	"	"	"
Stearns-Knight, Runabout	Roadster	3500	3	28.9	116	36x4½	36x4½	333
Stearns-Knight, Runabout	Toy tonneau	3500	4	"	"	"	"	"
Stearns-Knight, Regular	Touring	3500	5	"	121	"	"	334
Stearns-Knight, Regular	Limousine	4800	7	"	"	"	"	"
Stearns-Knight, Regular	Landaulet	4700	7	"	"	"	"	"
Stevens-Duyrea, X	Limousine	4000	7	36.1	124	34x4	34x4	335
Stevens-Duyrea, AA	Fore-door touring	3750	5	43.8	128	—x4½	—x4½	336
Stevens-Duyrea, AA	Fore-door touring	3900	7	"	"	36x4½	37x5	"
Stevens-Duyrea, AA	Torpedo	3850	5	"	"	—x4½	—x4½	"
Stevens-Duyrea, AA	Touring roadster	3750	4	"	"	"	"	"
Stevens-Duyrea, AA	Runabout	3750	2	"	"	"	"	"
Stevens-Duyrea, AA	Limousine	3750	7	"	"	36x4½	37x5	"
Stevens-Duyrea, AA	Landaulet	4950	7	"	"	"	"	"
Stevens-Duyrea, AA	Berline	5000	7	"	"	"	"	"
Stevens-Duyrea, Y	Fore-door touring	4000	7	54.1	142	36x4	36x5	337
Stevens-Duyrea, Y	Limousine	5150	7	"	"	"	"	"
Stoddard-Dayton, Saybrook	Limousine	3900	7	36.1	122½	36x5	"	340
Stoddard-Dayton, Special	Roadster	3300	2	40.0	"	36x4½	36x4½	341
Stoddard-Dayton, Special	Torpedo	3300	4	"	"	"	"	"
Stoddard-Dayton, Special	Touring	3500	7	"	130	36x5	36x5	342
Stoddard-Dayton, Special	Torpedo	3500	6	"	"	"	"	"
Stoddard-Dayton, Special	Limousine	4600	7	"	"	37x5½	37x5½	"
Stoddard-Dayton, Knight	Touring	5000	7	48.6	133	36x5	36x5	343
Stoddard-Dayton, Knight	Torpedo	4900	4	"	"	"	"	"
Stoddard-Dayton, Knight	Roadster	4900	2	"	"	36x4½	36x4½	"
Stoddard-Dayton, Knight	Limousine	6250	7	"	"	37x5½	37x5½	"
Stuyvesant, 50	Touring	4200	7	38.0	126	36x4½	36x4½	345
Stvyvesant, 50	Touring	4200	5	38.0	126	36x4½	36x4½	315
Stuyvesant, 50	Torpedo	4200	4	"	"	"	"	"
Suburban, Limited	Fore-door touring		2	29.4	110	34x3½	34x3½	346
Suburban, Limited	Roadster		3	"	"	"	"	"
Suburban, Limited	Fore-door touring		4	"	"	"	"	"
Suburban, Limited	Fore-door family car		5	"	"	34x4	34x4	"
Thomas, 6-40	Touring	4000	7	43.8	134	36x4½	37x5	347
Thomas, 6-40	Phaeton	4000	5	"	"	"	"	"
Thomas, 6-40	Surrey	4000	4	"	"	"	"	"
Thomas, 6-40	Runabout	4000	2	"	"	"	"	"
Velie, Special	Limousine	3750	7	32.4	121	36x4½	36x4½	352
Virginian, A-50	Fore-door touring	3000	7	40.0	130	40x4½	40x4½	353
White, G-B	Limousine	3800	5	22.5	120	34x4½	34x4½	361
White, G-B	Landaulet	3800	5	"	"	"	"	"
White, G-E	Touring	3300	5	36.1	"	36x4½	36x4½	362
White, G-E	Touring	3500	7	"	"	"	"	"
White, G-E	Roadster	3300	2	"	"	"	"	"
White, G-E	Limousine	4700	5	"	"	"	"	"
White, G-E	Landaulet	4700	5	"	"	"	"	"
White, G-E	Berline	5000	7	"	"	"	"	"
White, 6								362A
Winton, 17-C	Touring	3000	5	48.6	130	36x4½	36x4½	364
Winton, 17-C	Toy tonneau	3000	4	"	"	"	"	"
Winton, 17-C	Limousine	4350	7	"	"	"	"	"
Winton, 17-C	Fore-door limousine	4500	7	"	"	"	"	"
Winton, 17-C	Landaulet	4500	7	"	"	"	"	"

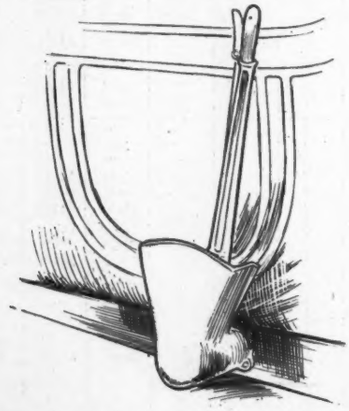


Changes and Improvements for 1912 on

Motor Age Presents Latest Ideas of American Engineers As Will Be Displayed By Automobile Board of Trade in First Week at Which Only Passenger Vehicles Will Be Seen

FOLLOWING along the lines generally adopted by makers of high-priced cars, the American Locomotive Co. has striven to increase the comfort of the users of Alco cars, not so much in the way of mechanical changes but in improvements in body design. As before the line consists of fours and sixes and the body styles have been materially altered. The tonneau, for instance, has been made roomier, with the cushions tilted slightly and made thicker to secure easier riding qualities. Doors are wider and the handles are placed inside. Around the body runs a 1¾-inch white line which enables one to pick out an Alco at a glance. In the Alco closed body there is an electric bulb that lights automatically as the door is opened and also illuminates the step for the purpose of assisting the passenger to alight comfortably at night. In both the touring car and limousine there is an invisible wired dome light in the top which is controlled by a push button on the rear seat. Also the limousine contains a ventilating system that prevents drafts. In the back are marine windows which enable the chauffeur to see what is going on in the rear. A Berline limousine has been added to the line.

Mechanically, the gear-shifting and brake levers have been placed inside the body, while the gas tank also has been concealed from the view of the bystander. The gasoline is fed to the carbureter by a new pressure system, the pressure being regulated by the speed of the motor. The lubrication system is automatic. The company has added no new models nor has it dropped any of the old ones, its line consisting of the 60-horsepower six-cylinder and the 40-horsepower four-cylinder.



ALCO POCKET FOR GEAR-SHIFT LEVER

AMPLEX

There are no radical changes in the Amplex cars for 1912, except that a new model, which will be known as the Baby Amplex is now in course of construction and will be ready for delivery around the first of May. This new model will comprise two body types, a roadster and five-passenger touring. The model H of 1911 is continued for 1912, but designated model K. Though there are no radical changes in this model, several improvements in refinements have been made upon it that are worthy of mention. A new carbureter has been fitted for which more power is claimed, and it is provided with a means of enriching the mixture to facilitate starting which is controllable from the steering post. The gasoline tank heretofore has been located under the front seats, now is suspended from the rear end of the chassis. The pressure which was heretofore maintained in this tank from the exhaust now is obtained from the pressure tank of the self-starting mechanism which eliminates the lengthy piping to the check valve from the front of the dash. One pound pressure is normally maintained in the gasoline tank. The self-starting mechanism itself remains unchanged except that the piping near the motor is more neatly and symmetrically arranged.

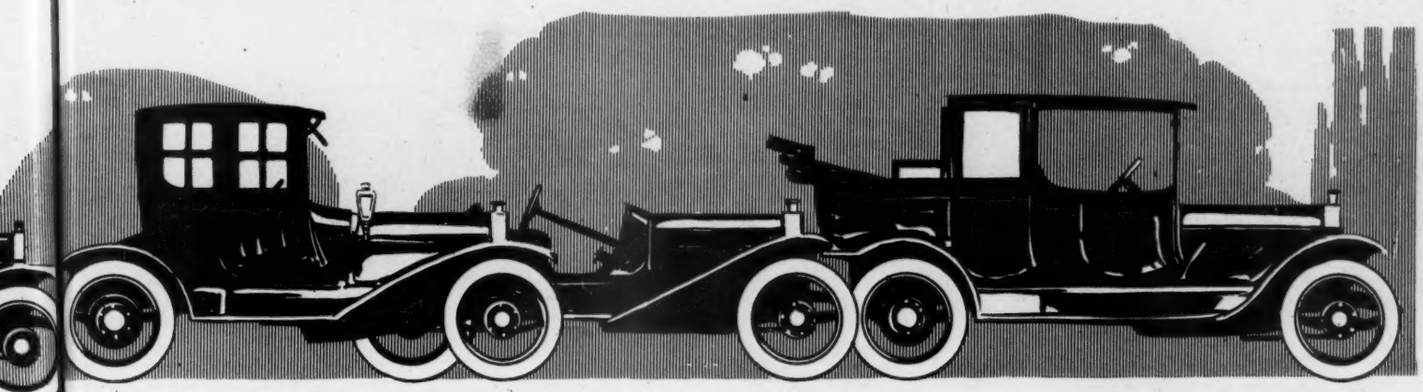
An important feature of the motor this year is the provision of a mechanism applied to the inlet pipe which causes the motor to run regularly without misfiring, when running idle at low speeds. This mechanism is controlled by a lever conveniently located on the dash. Tires have been enlarged from 36 by 4 to 36 by 4½ in front, and 36 by 5 rear tires now are 37 by 5 inches. Booth demountable rims have replaced the quick detachable.

The outward appearance of the car has been considerably improved by the adoption of a straight-line body design and by clearing the running boards of battery and tool boxes. Tools now are carried under the front seat and the batteries under the floor boards of the tonneau just back of the front seat. For 1912 the upholstery has been rendered far more comfortable by increasing its depth to 12 inches; and in addition to the equipment in 1911 there has been added a speedometer, a windshield and seat cover. The model K is made in but four body types for 1912 instead of five, as in 1911. The five-passenger, close-coupled style has been discontinued. The features of the Baby Amplex are given in detail in the specification tables.

AMERICAN

The American underslung, whose chief characteristics are its low, racy appearance, its adherence to the principle of carrying the frame underneath the axle, and its unusually large wheels, remains practically unchanged for the season of 1912, bearing the same mechanical features that always have been characteristic of the American product. Four new models have been added and are being delivered to the trade. These new models are designated types 22, 34, 56 and 32, which pertain respectively to the American Scout, American Tourist, American Traveler and American Roadster.

The American Traveler, type 54, which has been manufactured by this company for several years, is being continued for 1912 with no material changes, except that little refinements here and there have been added, such as slightly lengthening the



Cars in Madison Square Garden Show

Tendency Seems To Be To Include Equipment in the List Price —Six-Cylinder Continues To Gain Recruits—Body Lines Have Been Refined—Some Are Bringing Out New Models

tonneau of the body, and raising the floor boards so as to conceal the torsion-tube housing which formerly protruded in the center of the tonneau; arranging so that the radiator can be removed without disturbing the front axle; and providing indentations in the dash for bullet electric dash lamps, with ventilators underneath, the latter adding greatly to the comfort of front-seat passengers during the warm weather.

As for the new models, the type 56 has a 50-horsepower motor, with L-type cylinders cast in pairs; a selective sliding gear transmission giving four forward speeds, driveshaft inclosed in a torsion tube, a floating rear axle and 140-inch wheelbase. Types 34 and 32 are identical so far as the chassis construction is concerned, and their characteristic features are the 32-horsepower four-cylinder motor with its T-type cylinders cast en bloc. It has a three-speed selective gearset, the propeller shaft inclosed in a torsion tube, floating rear axle, and 118-inch wheelbase. The type 22 chassis has a four-cylinder 22-horsepower L-type en bloc motor, three-speed gearset, propeller shaft in a torsion tube, floating rear axle and a 102-inch wheelbase.

ATLAS

The Atlas marks the fourth American convert to the Silent Knight engine and the announcement, which was made only last month, marks the advent of a new Atlas model which is a radical departure from the two-cycle path which it has followed in the past. The two-cycle models have been continued without change, but the newcomer bristles with features outside of the Knight engine, two other innovations being the adoption of worm drive and an electric self-starter.

The Silent Knight motor that is used is a four with a bore of 4½ inches and a stroke of 5½, the claimed horsepower being 50 at 1,300 revolutions. The electric self-starter, it is asserted, will spin the motor at high speed for 15 minutes. It forms a part of the flywheel and has direct drive, with no gears. The clutch is somewhat similar to the one used on model O, a dry-plate, which is inclosed in the flywheel, and has been improved and enlarged. The gearset is mounted on the rear axle and all transmission bearings and rear axle bearings are of the extra large, heavy annular type. The gears are of chrome vanadium steel. A universal joint is used in combination with a large torsion and drag-rod tube.

The full floating rear axle is of the spiral-drive type, with the worm mounted under the gear. The front axle is a Timken, with Timken bearings in the hubs and in the head of the steering yoke. The rear springs are three-quarter elliptic and the front half-elliptic; the brakes are both mounted on the rear wheels; the frame is pressed steel; the wheels equipped with demountable rims carrying 37 by 5 tires on the five and seven-passenger models and 36 by 4½ on the others. The five-passenger has a wheelbase of 140 inches and the seven-passenger 140. The clearance is from 9½ to 10 inches. The Bosch dual ignition system is used.

In the way of bodies the lines include torpedo and phaeton with fore-doors, the bodies being made of sheet aluminum and the cushions being of the 8-inch variety. The light all are electric, power for which is furnished by a storage battery which is charged by the electric starting motor.

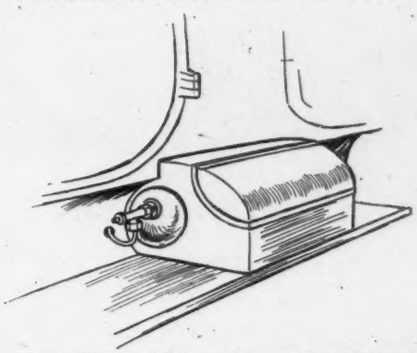
BRUSH

The Liberty-Brush, the lowest-priced motor car on the market, and the Standard Brush cars remain unchanged for the season of 1912. The Liberty-Brush, so named because it was introduced to the public on the Fourth of July, 1911, is one of the features of the line. Mechanically the Liberty-Brush is almost identical in design with the Standard Brush, except that the latter has a balanced gear in the engine and running boards on the sides instead of steps. The most prominent features of the Brush cars are originality and novelty in design, and the simplicity of their construction. The motor is a water-cooled single-cylinder four-cycle vertical type located in front under a hood and mounted by two-point suspension. The transmission and change-speed mechanism comprising multiple-disk clutches and internal gearing are contained in a single oil-tight casing which is bolted in a unit with the differential and jackshaft housing. A shaft transmits power from the motor to this mechanism and from the jackshaft the power is delivered through side chains to the rear wheels. The axles and frame are of solid oil-treated hard wood.

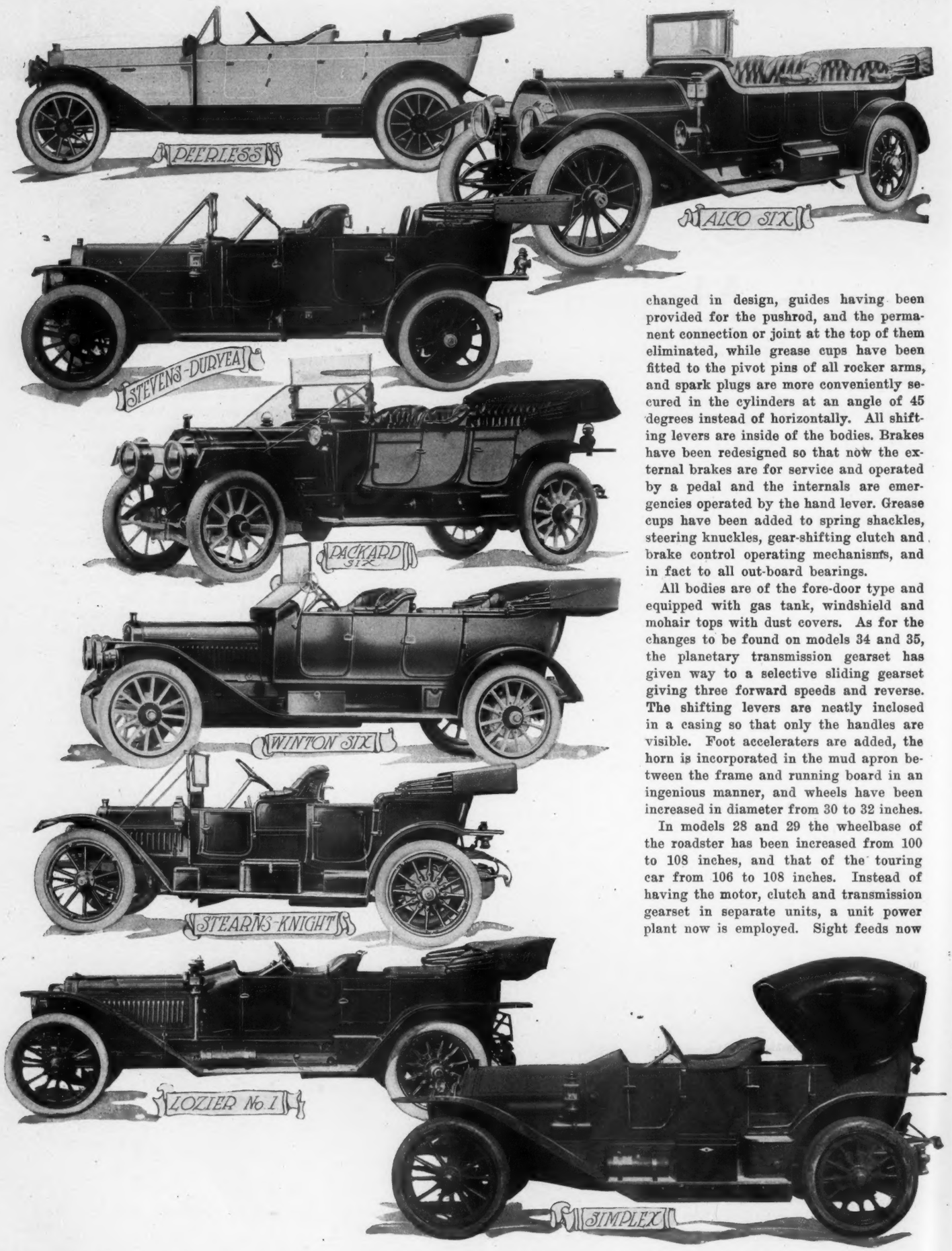
BUICK

As for the changes in the Buick line for 1912 there is none of a radical nature, but many little improvements and refinements have been made in all models. The features of the 1911 cars included seven models applied to four chassis types; these were designated models 32-33, 26-27, 21, 38-39, and 17; the odd numbers all being touring cars and the even numbers roadsters, except the model 17, which was a limousine. For 1912 the respective models are designated 34-35, 28-29, 21, 43, and 41 limousine. Model 38, which for 1912 would have been model 40, is discontinued, leaving but six models for 1912. The following changes are common to all Buick cars:

In the motors the rocker arms have been



ALCO COMBINATION TOOL BOX AND GAS TANK HOLDER



changed in design, guides having been provided for the pushrod, and the permanent connection or joint at the top of them eliminated, while grease cups have been fitted to the pivot pins of all rocker arms, and spark plugs are more conveniently secured in the cylinders at an angle of 45 degrees instead of horizontally. All shifting levers are inside of the bodies. Brakes have been redesigned so that now the external brakes are for service and operated by a pedal and the internals are emergencies operated by the hand lever. Grease cups have been added to spring shackles, steering knuckles, gear-shifting clutch and brake control operating mechanisms, and in fact to all out-board bearings.

All bodies are of the fore-door type and equipped with gas tank, windshield and mohair tops with dust covers. As for the changes to be found on models 34 and 35, the planetary transmission gearset has given way to a selective sliding gearset giving three forward speeds and reverse. The shifting levers are neatly inclosed in a casing so that only the handles are visible. Foot accelerators are added, the horn is incorporated in the mud apron between the frame and running board in an ingenious manner, and wheels have been increased in diameter from 30 to 32 inches.

In models 28 and 29 the wheelbase of the roadster has been increased from 100 to 108 inches, and that of the touring car from 106 to 108 inches. Instead of having the motor, clutch and transmission gearset in separate units, a unit power plant now is employed. Sight feeds now

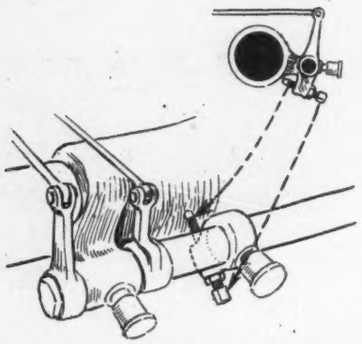
are provided on the dash to show the operation of the oiling system, the fan belt is of improved design, a leather-faced cone clutch replaces the multiple-disk type previously employed; Baker demountable rims instead of quick detachable are employed. The accessibility of this motor, clutch and gearset is a feature of this model, and it is apparent that considerable attention has been given to the details of construction throughout the car. Lamp brackets are braced and silent friction plungers are provided in the engine control levers instead of ratchet ones.

The model 21 remains unchanged, except for the inside drive and fore-door bodies. Model 43 has in addition to the general changes a sight feed for the oiling system on the dash, a cone clutch is used instead of a multiple-disk; it has a floating instead of semi-floating rear axle; Baker demountable rims are fitted; a hooded or cowl dash design is employed; and there are many little refinements in body design.

CARTERCAR

The friction transmission principle that has been characteristic of the Cartercar since its inception remains unchanged for the season of 1912; but the line for the coming season includes a wider range of chassis and body molds, chiefs of which are a new seven-passenger model S and five-passenger R. The 30-horsepower model H of 1911 is continued unchanged for 1912, except that it has a heavier rear axle, larger brake drums, an I instead of a tubular front axle and a self-starting mechanism.

The new models R and S are practically identical except that the cars are of dif-



BUICK BRAKE ARM ADJUSTMENT

ferent size. These models in turn are the same as model H of 1911 with the following exceptions: Valves are inclosed. The oil pump is inclosed in the reservoir. Helical timing gears are employed. A three-bladed cast aluminum fan replaces the four-bladed pressed aluminum design. The transmission mechanisms are arranged in two units with the driving disk, shaft and parts comprising one unit; and the driven wheel with its shaft and bearings completing the other unit. The operating mechanism of the disks are enclosed in a dust-proof case, the larger disk has been increased from 20 to 23 inches in diameter; and a new improved friction alloy has been found for this disk which is removable for replacement. The friction wheel also is increased in diameter from 20 to 22 inches; and two keyways are formed in the cross shaft instead of one; while a new and improved shifter crank is fitted. A new design of silent chain now is employed instead of the ordinary design, and radius rods have adjusting plugs to take up wear in the ball-and-socket joint. A floating rear axle has replaced the previously used semi-floating type, and New Departure ball bearings are provided for the rear wheels and axles.

Three-quarter elliptic rear springs replace the semi-elliptics and the frame is raised over the rear axle and narrowed a little more in front of the dash to give a shorter turning radius. There are now two sets of brakes of internal and external design operating upon the rear wheel drums instead of one set of internal expanding brakes. Truss rods have been removed from the rear axle; wheels are larger, the wheelbase is increased to 122 inches and the steering mechanism is a worm-and-nut instead of a worm-and-sector design. An 18-inch instead of a 16-inch steering wheel is employed and the metal rim of the wheel is integral with the spider. The wheel sector for the engine control levers now has no teeth, silent-operating friction plungers having been fitted.

To enhance the appearance of the car running board irons now are bolted inside; the frame has a filler on the front horns which also acts as a reinforcement, lamp brackets have integral windshield and top strap supports and are secured to the fenders and to each other to make a more rigid construction. The drip pan of the car no longer extends under the motor, so that the lower part of the case can be readily lowered.

The gasoline tank now has 25 gallons capacity. Transmission grease cups are brought outside of the frame. Bodies are of the fore-door straight line design with the door handles and hinges concealed. Transmission and brake control levers are inside of the body. The horn is under the hood and the bulb also accessibly arranged inside of the body.

BUICK DIAGONAL SPARK PLUG RECESS

CASE

The most notable feature of the Case line for 1912 is the addition of a new model, known as the Greater Case 40. While the increase in the price of this machine will be slightly over the 1911 30-horsepower car, it includes many changes and refinements in accessory equipment, style of bodies and in the general construction of the machine, to say nothing of the additional horsepower of the engine. Among the body types that are fitted to the Case 40 chassis are a five-passenger touring car painted Case blue, and a Case gray roadster. It is claimed that in a brake test made on the 40-horsepower engine used in the new chassis 52 horsepower was developed; and that, after subjecting the new self-starter to considerable hardship, such as changes in weather conditions, it remained in excellent working order.

Among the notable changes in Case construction, a new type of Remy magneto is used in the ignition system; a Stromberg carbureter has been fitted; the cellular type of radiator is improved; roller push-rods are fitted, and the valves are encased; there is an increase in piston displacement; a magnetic oil indicator is fitted to the dash; a gravity gasoline tank is provided for hill-climbing; a gasoline gauge is fitted at the top of the tank, and a gasoline shutoff valve is provided, which may be regulated from the seat.

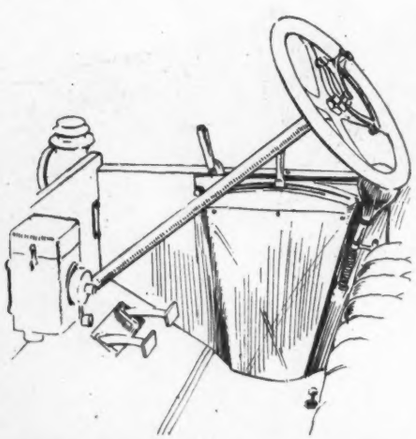
The clearance of the Case cars has been increased to 11 inches, although in looks it remains the same. Timken axles are employed; wheels are equipped with demountable rims, and the wheelbase has been increased to 120 inches. Inside and outside tool boxes have been provided in side aprons and rear; clutch brakes are improved; inside and outside control levers are fitted, and a Brown-Lipe transmission gearset has been adopted. The car has been reduced in weight to 2,810 pounds.

The Case 30 which is carried over from 1911 also has been much improved upon and many favorable additions made to it, such as a self-starter, and practically all of the changes above mentioned for the new Case 40.

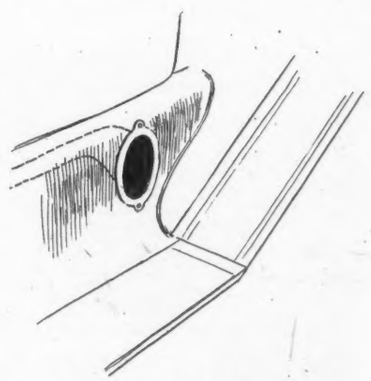
CADILLAC

An automatic electric-starting device, electric lights, two complete ignition systems, a scientifically developed carbureter, more power, larger wheels and tires, larger brake drums and steel bodies of the latest accepted design are a few of the numerous improvements or refinements to be found in the Cadillac cars for 1912. The fundamental characteristics of the Cadillac design, however, remain unchanged.

Copper waterjackets and built-up cylinders remain characteristic features of the Cadillac design. The cylinder walls are cast separately, as are also the combustion chambers, the latter being attached to the former by right and left thread nipples. The copper waterjacket is secured between the detachable head and the body of the cylinder at the top and the bottom is secured by a ring which is shrunk into place. The advantages claimed for this construction are that it insures uniform thickness of the cylinder walls as well as uniform space for water circulation and when cylinders, valve chambers and waterjackets are made sep-



BUICK INCLOSED GEAR-SHIFT LEVERS



BUICK CONCEALED HORN

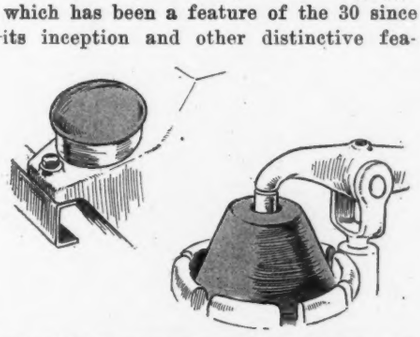
arately, as in the Cadillac, an injury to any one part calls for the replacement of only that particular part at a moderate cost.

By enlarging the bore of the cylinders for 1912 from 4 to 4½ inches the motor now has a horsepower rating of 32.4, according to the S. A. E. formula, which is an increase of almost 8 horsepower over the motor used in the Cadillac cars for 1911. The crankcase of the motor is of cast iron mounted by three-point suspension on two cross members of the frame.

CHALMERS

For the season of 1912 the Chalmers has joined the six-cylinder brigade, introducing the new model to the public for the first time at the New York show. A unit power plant comprising a ball-bearing self-starting motor is a feature of the new six. Control of the car is conventional with two pedals for operating the clutch and service brakes instead of-operating both by means of the same pedal as in the other Chalmers models. One of the most important features of the new six-cylinder car is that there is such a marked similarity between it and the four-cylinder model 36 that but few new machine tools, jigs or dies are required in its production. For 1912 the Chalmers line comprises three chassis models carrying more than thirteen different body styles. Foremost among these is the model 36 which was brought out late this fall and which, like the six-cylinder model, is equipped with a compressed-air self-starting device. The Chalmers 30 and 40 with which the public is already familiar are continued with no radical changes but with such improvements and general refinements that another season has made practicable.

All types of the model 30 for 1912 are sold fully equipped and, except the coupé, at the same price as the 1911 touring car without equipment. All 30 bodies, except the open-front pony tonneau, are of the full fore-door type and like the 36 have the forward part ventilated. Like the 30 the Chalmers 40 for 1912 is little changed mechanically, and is sold fully equipped for the same price as the 1911 40 without equipment. As for the mechanical details of the new model 36, it quite resembles the model 30. The crankshaft is of the same short stubby two-bearing type which has been a feature of the 30 since its inception and other distinctive features claimed for the motor are: New piston ring, which eliminates motor smoking; an unusually large camshaft; and push-rod tappets of extreme size; unusually heavy rocker arms; and a new crankcase construction which protects the upper parts of the motor from road dirt. The crankcase of the motor which is of aluminum is of the barrel type in which the crankshaft, with its two large annular ball bearings intact is shoved into place from the rear end.

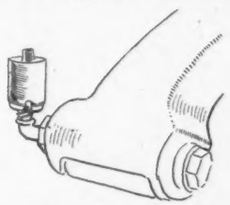


CHALMERS BREATHER PIPE COVER AND SILENCING CAP ON VALVE STEM

The construction in this case differs from that of the 30 in that an integral web closes in the space between the motor and the frame. The motor is supported on four stout legs cast integrally with the case, two of these being opposite the front end of the motor and two opposite the encased flywheel.

CORBIN

There are two Corbin models, 30 and 40, both of which are continuations of 1911 models with very few changes. Each is a characteristic type, but the two are radically different. The 30 is an old model. Its design started in 1906, the rear axle was brought out in 1907, the motor in 1908, and a few steering gear changes have been made since. It uses a unit motor and gearset, the unity being established by a continuous lower casting for the two parts. This is one of the few motors remaining with separately-cast cylinders and a five-bearing crankshaft. Another characteristic is that the camshaft with the tappets is carried in a separate housing which bolts to the side of the crankcase.

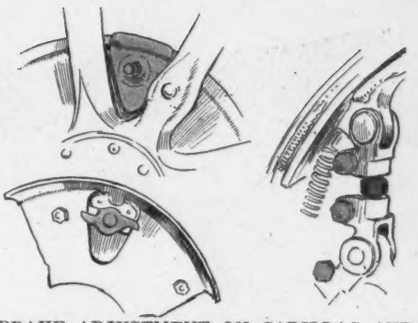


NEW CADILLAC GREASE CUP

The Corbin 40 is a conventional design with twin-cylinder castings of T design, the stroke-bore ratio being 1.5 to 1. This motor uses a three-bearing crankshaft. A leading characteristic is the use of a non-splash circulating system of oil. The lower ends of the connecting rods do not dip into an oil bath; rather the pump delivers to the three crankshaft bearings and through the drilled crankshaft to the four lower connecting rods. In this model the motor and gearset constitute a separate unit; the rear axle housing is a steel stamping and the differential with its pinion and shaft is carried as a unit in the axle housing.

COLUMBIA

The Columbia line of cars is radically different from last year. The greatest difference is the adoption of the Knight type of sleeve-valve motor for one model of 38 horsepower. It has 4⅞-inch bore, 5.5-inch stroke and is mounted on a chassis with 129-inch wheelbase and specially intended for six and seven-passenger bodies. The Knight motor employed in this is the standard double-sleeve design, in which two reciprocating sleeves which take the place of valves are placed within each cylinder. Roughly speaking, the sleeves resemble two lengths of stove pipes, placed one within the other, with a piston put inside of them and then all placed in the cylinder. The sleeves have ports or openings on opposite sides which cover and uncover intake and exhaust openings in the opposite sides of the cylinder.

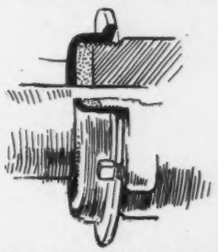


BRAKE ADJUSTMENT ON CADILLAC AND ITS ACCESSIBILITY

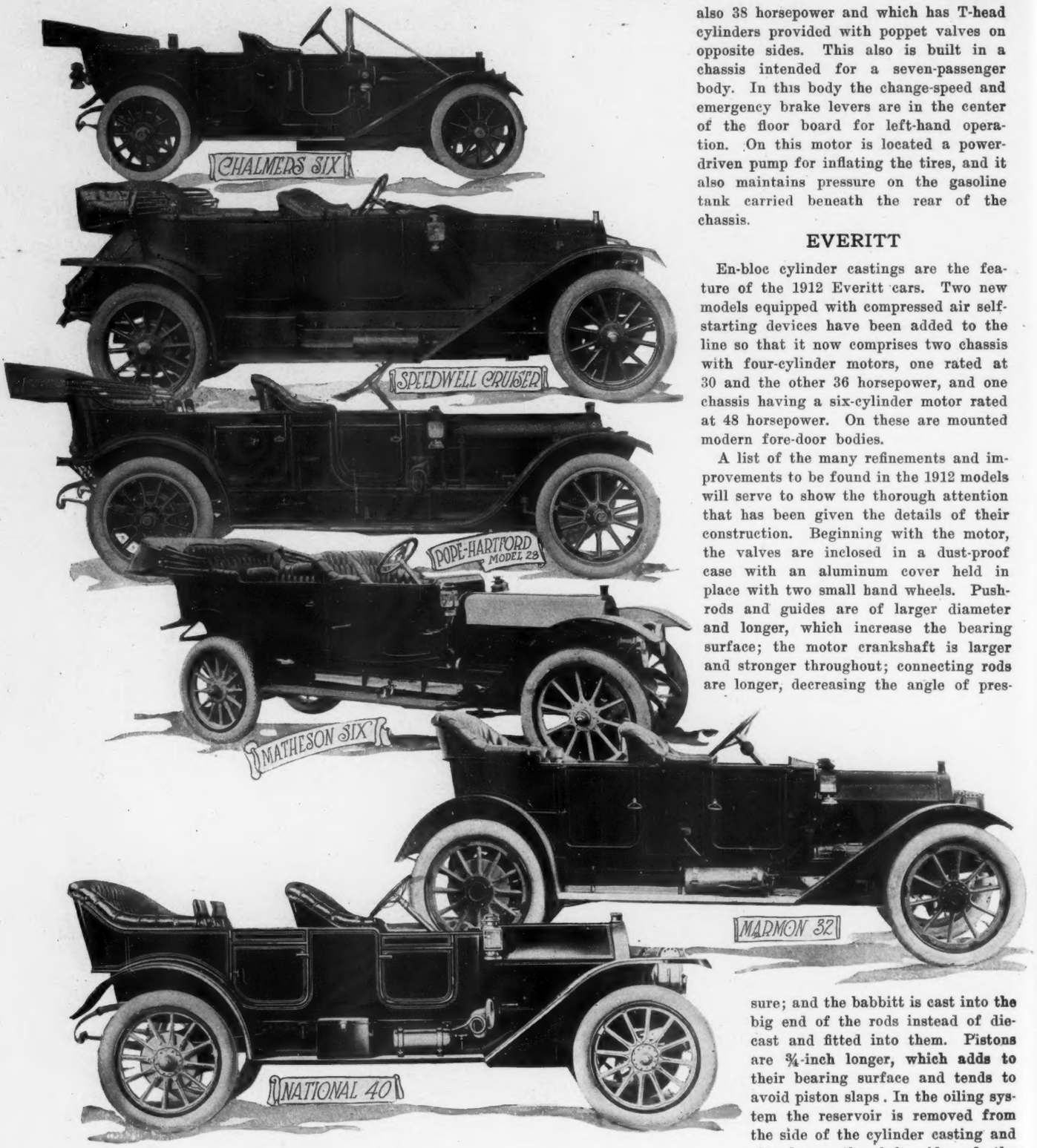
As with all motors of the Knight type, the cylinder heads are separate castings and are completely waterjacketed, there being transfer pipes to conduct the water from the jacket space surrounding the wall to the jacket space of the head. The operation of the sleeves is accomplished by an eccentric shaft driven by silent chain from the crankshaft. These sleeves have a stroke of 1⅛ inches, thereby giving a travel of 93 feet per minute. The sleeves are set to reciprocate so that one is approximately 70 degrees in advance of the other. There are periods when one sleeve is going up and the other coming down, and by this arrangement it is possible to get a very quick opening and closing of the intake and exhaust ports, a feature which is to an extent responsible for the high efficiency of these motors.

The combustion chamber in this motor is of slightly different shape from that used in the Stearns-Knight type, in that it is scarcely so conical and two spark plugs are located in the head. The oiling system is the hinged trough beneath each connecting rod, and into which troughs the connecting rod scoops dip. These troughs are interconnected with the throttle so that with a wider throttle and higher engine speed more oil is fed.

There is another new Columbia model,



CADILLAC PACKING ON GEARCASE



It will be noticed that the fore-door is decidedly prominent in the field which includes such cars as the Chalmers six, Speedwell, Pope-Hartford, Matheson, Marmon and National. The Speedwell has called its model the Cruiser, a name which seems particularly apropos, as one may see by the illustration, the impression given being that of a gunboat. Carrying this impression to the next illustration, the Pope-Hartford looks not unlike one of those speedy torpedo boats, with its straight-line body and with the top concealing the rear of the tonneau. The Matheson is a seven-passenger six, with a square cowled dash, which differs some from the conventional. The National also has auxiliary seats, which gives it a carrying capacity of seven persons

also 38 horsepower and which has T-head cylinders provided with poppet valves on opposite sides. This also is built in a chassis intended for a seven-passenger body. In this body the change-speed and emergency brake levers are in the center of the floor board for left-hand operation. On this motor is located a power-driven pump for inflating the tires, and it also maintains pressure on the gasoline tank carried beneath the rear of the chassis.

EVERITT

En-bloc cylinder castings are the feature of the 1912 Everitt cars. Two new models equipped with compressed air self-starting devices have been added to the line so that it now comprises two chassis with four-cylinder motors, one rated at 30 and the other 36 horsepower, and one chassis having a six-cylinder motor rated at 48 horsepower. On these are mounted modern fore-door bodies.

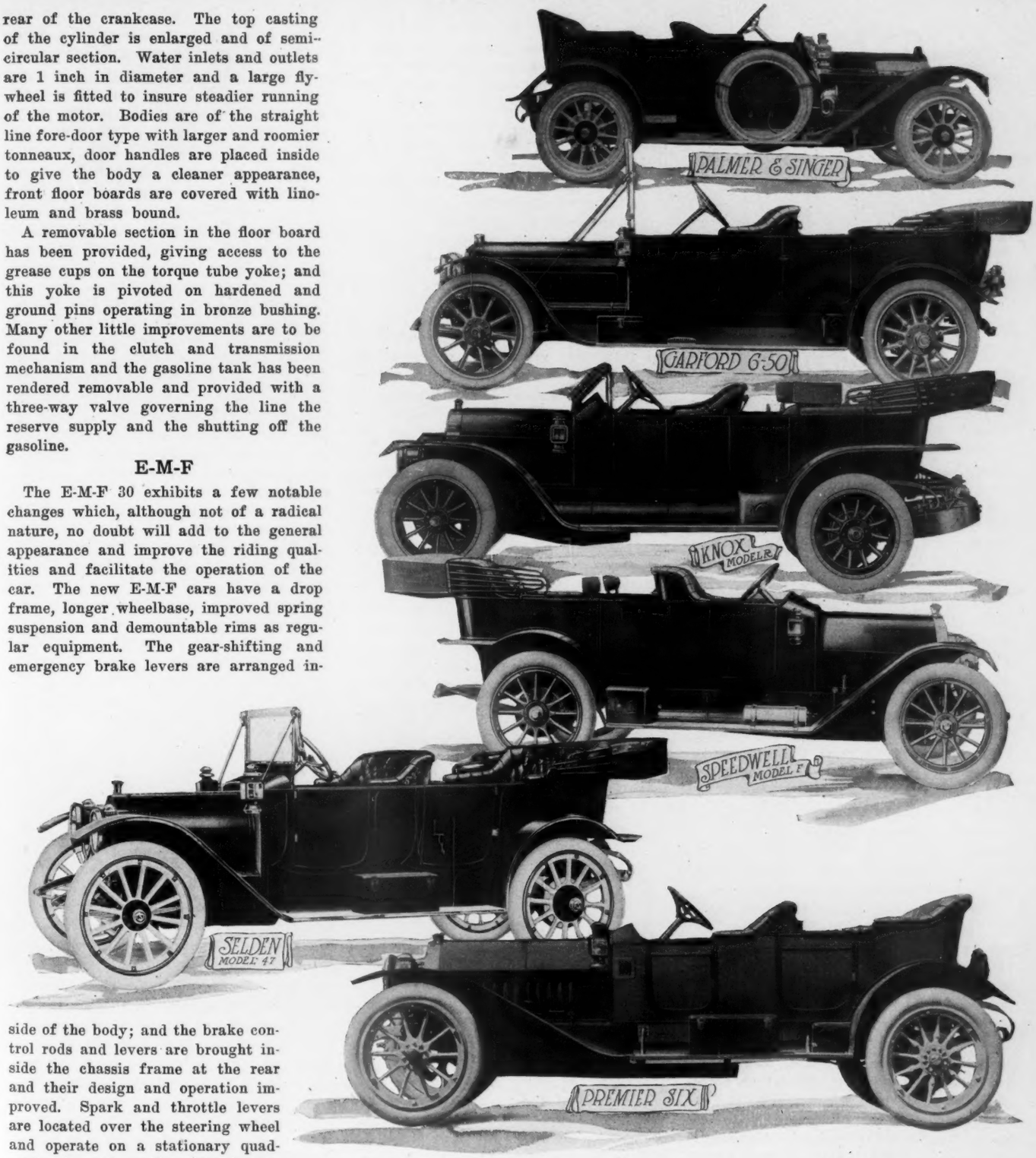
A list of the many refinements and improvements to be found in the 1912 models will serve to show the thorough attention that has been given the details of their construction. Beginning with the motor, the valves are inclosed in a dust-proof case with an aluminum cover held in place with two small hand wheels. Push-rods and guides are of larger diameter and longer, which increase the bearing surface; the motor crankshaft is larger and stronger throughout; connecting rods are longer, decreasing the angle of pressure; and the babbitt is cast into the big end of the rods instead of die-cast and fitted into them. Pistons are ¾-inch longer, which adds to their bearing surface and tends to avoid piston slaps. In the oiling system the reservoir is removed from the side of the cylinder casting and placed on the left side of the lower half of the crankcase; the oil reservoir is provided with an indicator showing the oil level at all times; there is a cored passage extending from the valve side of the motor to the opposite side between the center cylinders and the inlet pipe of the carbureter is secured or flanged to this passage in a neat fashion. There are two combined breathers and fillers, one on the timing gearcase cover and one on the right hand side at the

rear of the crankcase. The top casting of the cylinder is enlarged and of semi-circular section. Water inlets and outlets are 1 inch in diameter and a large flywheel is fitted to insure steadier running of the motor. Bodies are of the straight line fore-door type with larger and roomier tonneaux, door handles are placed inside to give the body a cleaner appearance, front floor boards are covered with linoleum and brass bound.

A removable section in the floor board has been provided, giving access to the grease cups on the torque tube yoke; and this yoke is pivoted on hardened and ground pins operating in bronze bushing. Many other little improvements are to be found in the clutch and transmission mechanism and the gasoline tank has been rendered removable and provided with a three-way valve governing the line the reserve supply and the shutting off the gasoline.

E-M-F

The E-M-F 30 exhibits a few notable changes which, although not of a radical nature, no doubt will add to the general appearance and improve the riding qualities and facilitate the operation of the car. The new E-M-F cars have a drop frame, longer wheelbase, improved spring suspension and demountable rims as regular equipment. The gear-shifting and emergency brake levers are arranged in-

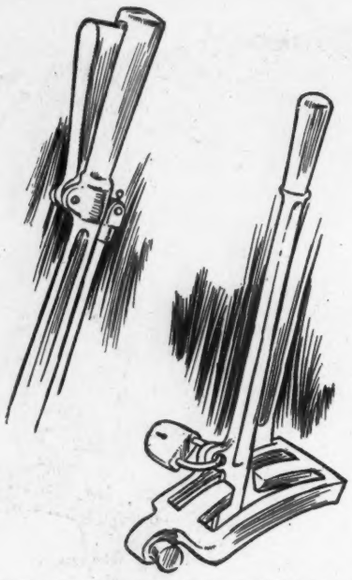


side of the body; and the brake control rods and levers are brought inside the chassis frame at the rear and their design and operation improved. Spark and throttle levers are located over the steering wheel and operate on a stationary quadrant. An extra adjustment is provided in the steering mechanism; and ventilators are provided in the dash for the comfort of front seat passengers in warm weather.

ELMORE

Although the two chassis models upon which the Elmore cars are built are very little changed in their general dimensions there are some important changes in the design. The two-cycle motor, which is the distinguishing feature of this car, has been redesigned to a certain extent, although

Palmer & Singer, Garford, Knox, Speedwell, Selden and Premier all are additional examples of the body styles prevailing among the higher-priced makes. The Garford six is a new one and is distinguished by a long bonnet and a torpedo-like rear. The Knox also has a rounded effect in the rear. The Palmer & Singer has refined its body lines and now presents a pleasing appearance. The Speedwell, besides the Cruiser, has in its model F a seven-passenger car of conventional style. The Selden also has a big touring car which is fore-doored like the others. The Premier six, with a long, rangy body, carries out the idea of speed and power at which the designer has aimed and is shown without top or windshield



GARFORD LEVER LOCK RELEASE AND HUDSON LOCK ON GEARSHIFT

the same cylinder dimensions and general arrangement are retained. The gas distributor at the base of the motor, which takes the place of the valves of a four-cylinder motor, shows perhaps the most radical change. This year it is driven by a silent chain from the crankshaft instead of by gears as is in previous practice. The distributor gate, which has heretofore been placed horizontally along the distributor shaft, for the coming season is vertical in order to prevent any chance of binding. Like the distributor shaft, the magneto is driven by a silent chain instead of gears and appears this year on the right side of the motor instead of on the left side as formerly. Further, a magneto of K-W design is fitted to the smaller model, the 26 and 27, in addition to the Atwater Kent ignition system employed last year.

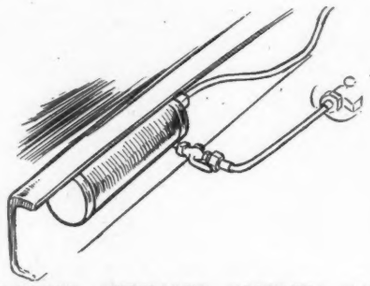
The motor as a whole shows more careful design than formerly and also that the results of past years' experience have been thoroughly studied. For instance, the screens in the by-path which until 1911 were fitted to prevent back firing in the crankcase, but which were omitted last year, are again fitted. There has been a radical change in the clutch, which this year is of the expanding-band type operating in oil instead of the multiple-disk form employed in previous models. On the model 26 and 27 chassis with 108½-inch wheelbase and 32 by 3½-inch tires three

COLUMBIA AIR PUMP

bodies are fitted; a torpedo roadster, a fore-door four-passenger touring car and a five-passenger light torpedo with fore-doors. The models 36, 37 and 38 chassis carry three bodies, all of which are of the fore-door type. One of these is a five-passenger touring body, another a four-passenger detachable tonneau and the third a five-passenger torpedo type. This has 114-inch wheelbase and 34 by 4-inch tires. All levers are inside the body this year and the equipment has been changed, in that a gas tank is supplied instead of an acetylene generator as formerly.

FLANDERS

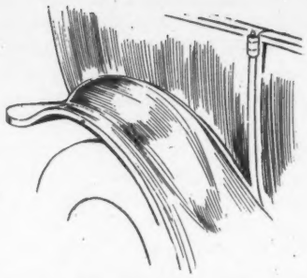
As for the changes in the Flanders 20 for 1912 there are several improvements in the motor which render its various features more accessible and increase its power. The exhaust pipe is no longer cast integrally with the cylinder, but is a separate feature, as in the E-M-F motor. The inlet manifold also is slightly changed so that the carbureter is brought back a little to make room for the magneto, which now occupies a more accessible position just to the rear of the front motor support. This change has necessitated the removal of the water pump to the front of the front cross support of the motor on the left, where it, too, is more accessible. The lowest point in the cooling system now is at the bottom of the water pump and a petcock is provided at this point for the purpose



GARFORD AUXILIARY GASOLINE TANK FOR HILL-CLIMBING

of draining the system in cold weather. Instead of a cast-iron crankcase an aluminum one is now employed and the oil reservoir is cast integrally with it. By rendering the pushrod adjustable the noiselessness of the motor may be maintained, while by improving the contour of the cams, by fitting the new carbureter with an adjustable needle valve, increasing the compression, it is claimed considerable more power is obtained. The steering mechanism has been changed from the internal and external gear type to an improved worm-and-sector design.

A rubber band has been inserted in the periphery of the clutch under the center of the clutch leather to promote smooth engagement. The transmission gearset is redesigned, converting it in a selective type of three forward speeds instead of a progressive design of two forward speeds; and a Timken roller bearing has replaced



PECULIAR SHAPE OF GARFORD MUDGUARD

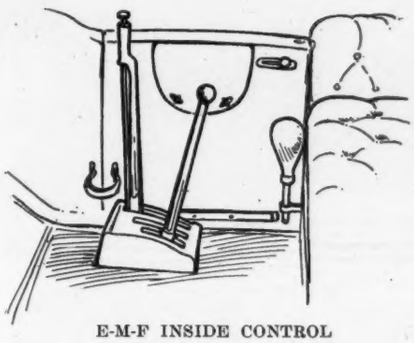
the radial ball bearing at the rear end of the main shaft of the gearset; two pinions have been added to the differential. Brakes have been rendered more efficient by changing from the two internal expanding shoes arranged side by side, to an internal and external design; thus, by having one brake acting on the inside and the other on the outside of the drum a considerable increase in braking surface is obtained.

FRANKLIN

Franklin remains the great exponent of air-cooling in America and has five models in which this cooling is used. An important change has been made in this connection in that the auxiliary exhaust valves, which have been used for so many years, have been discontinued. These were mechanically-operated poppet valves located in the side of the cylinder at a point just above the piston when it was at the bottom of the stroke. It was claimed that fully 70 per cent of the hot exhaust gases escaped through these valves, thereby aiding in the cooling system. Another important change in the Franklin engine is the adoption of a circulating oiling system in place of the mechanical-oiler type which the company has retained up to the present. The oil reservoir with pump is incorporated in the crankcase base and delivers to the crankshaft bearings and through the drilled crankshaft to the lower connecting rod bearings.

A change in conjunction with the valves, which are located in the cylinder heads, is that they fit directly in the cylinder head and are not held in cages as formerly. The jacket construction within the bonnet is continued and each cylinder carrying its vertical flanges for air-cooling is in turn surrounded by an air jacket through which the cooling air is drawn by the flywheel. It is claimed that the partial vacuum created by the flywheel is equal throughout the air chamber in the bonnet, thereby furnishing equal cooling facilities for all of the cylinders.

On the ignition a governor is used to care for the timing of the magneto spark on all but the smallest model which is built with a fixed spark. An interesting trend in the five Franklin models is that of maintaining the square motor in these times when the long-stroke is so much discussed. Another detail is that the bore



E-M-F INSIDE CONTROL

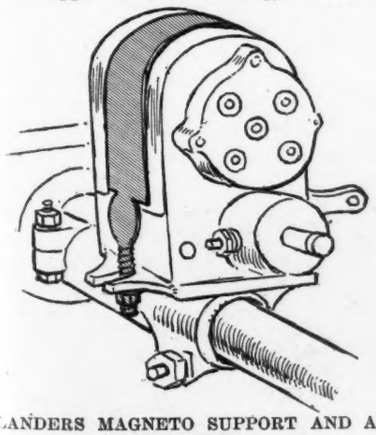
of model H, which was 4.5 inches in 1911, has been reduced to 4 inches for the coming season. On the smaller model the cylinders are 3⅜ inches square. On model M, which was a four-cylinder motor last year, six cylinders are used for this season and the motor is 3⅝ inches square. On models B and H, both six-cylinder machines, the motors are 4 inches square.

GARFORD

Two new chassis models have been added to the Garford line for 1912, while the 40-horsepower and model G 8 chassis brought out for the season of 1911 completes the line and remains unchanged. The two new chassis are the model G 14, a six-cylinder, 50-horsepower machine; and the G 12, a four-cylinder, 34-horsepower model. All of these are equipped either with touring, limousine, or landaulet bodies of up-to-date design.

The new six-clinder model has a motor with L-type cylinders, cast in threes; a leather-faced cone clutch with cork inserts and springs under the leather; a selective sliding gearset located amidship and giving four forward speeds; a propeller-shaft, with two universal joints that transmits power to a floating rear axle; an I-beam front axle is employed; the frame is of pressed channel steel narrowed in front of the dash to insure a small turning radius; it is mounted on semi-elliptic front springs and three-quarter platform rear springs; wheels are equipped with 37 by 5-inch tires and the wheelbase is 135 inches.

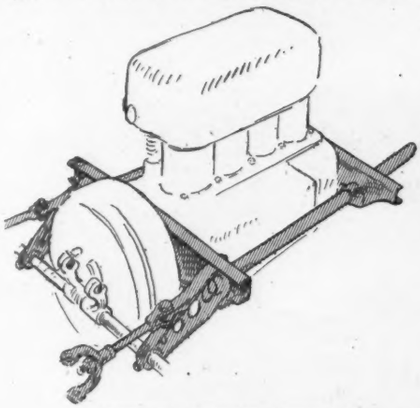
The motor of this car has an aluminum crankcase divided horizontally with the crankshaft, supported by three bearings in the upper half, and a sump or reservoir



FLANDERS MAGNETO SUPPORT AND ATTACHMENT

of the circulating oiling system incorporated in the lower detachable portion. In this oiling system a gear-driven pump forces oil through internal leads to the bearings of the motor, and in addition to this splash lubrication takes place. The overflow from the splash basins passes through strainers and returns to the reservoir below. A double-distributor Bosch magneto is used in the ignition system.

The carbureter is the Garford double-jet design. Valves are inclosed and adjustable valve tappets are provided. The engine gears are of helical design and made of cast iron and steel. Crankshaft bearings are of white bronze, phosphor bronze camshaft bearings are fitted, and there is a ball thrust bearing in the clutch, Hess-Bright annular ball bearings are used in the gearset and rear axle, and wheels are mounted on adjustable cup-and-cone ball bearings. The new Garford G 12 greatly resembles the 30-horsepower model manufactured by the Garford company 2 years ago, and resembles the model 40 of 1911



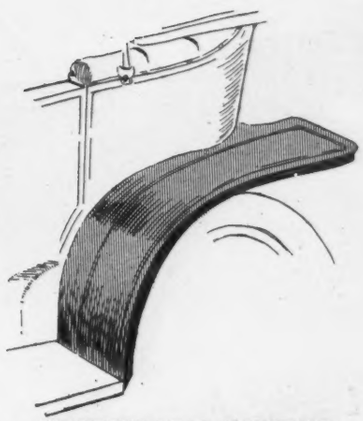
FLANDERS ENGINE SUPPORT

and 1912, except that its cylinders are cast en bloc; and the dimensions are smaller throughout.

INTER-STATE

The Inter-State cars appear as two chassis models this year, a 40 and a 50 replacing the two models of last year's product. The motors of both are larger than those used heretofore. In the 40, though the bore remains at 4½ inches, the stroke has been increased ½ inch, making it 5½ inches in length. The four cylinders are cast en bloc this year instead of in pairs, but the method of arranging the valves on the same side is retained. There are no external manifolds, these being cast integral with the cylinders. Valve springs and push rods are inclosed and the valves are interchangeable. Cooling is maintained by means of a centrifugal pump operated by spiral gears. The integral construction of the exhaust manifold with the cylinders permits the hot gases to be cooled and relieves back pressure somewhat.

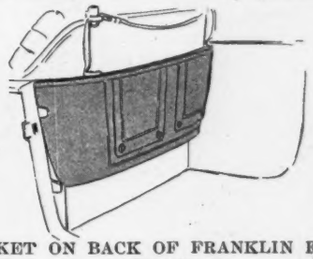
Lubrication has been slightly altered. The spiral-gear-driven oil pump is located in the bottom of the oil pan and provided with a distributor gear which supplies each



FLANDERS REAR MUDGUARD

bearing by an independent line. Last year the pump was placed up on the side of the crankcase. The ignition of the motor has been changed from the double system with high-tension magneto employed before to the Apleo dynamo-motor system by which ignition, starting and lighting are obtained. A carbureter of special design is fitted this year and there also has been a change in the location of the clutch by which it is made a unit with the flywheel, doing away with the universal joint between these members in last year's construction.

The clutch is multiple-disk type with and bronze disks with cork inserts, eight bronze and seven steel disks operating in



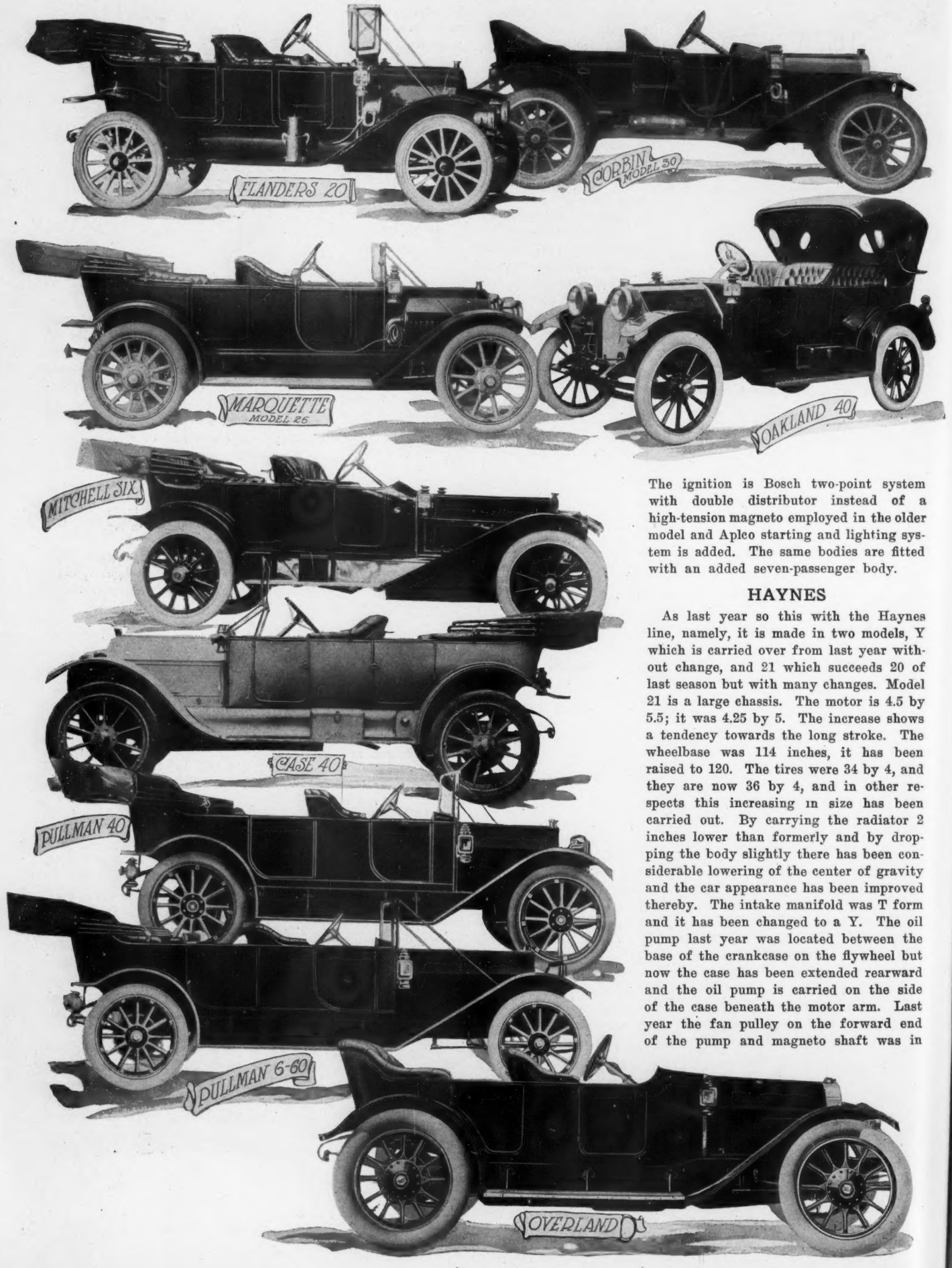
POCKET ON BACK OF FRANKLIN FRONT SEATS

oil. The gearset this year is a separate unit instead of being combined with the clutch as last year. A floating rear axle is employed instead of the semi-floating design and the emergency brakes are of the internal expanding type instead of external contracting as used previously.

The wheelbase remains at 118 inches but the wheels have been increased 2 inches in diameter, making them 36 by 4 inches instead of 34 by 4 inches. A five-passenger body, a four-passenger demi-tonneau, both equipped with fore-doors, and a roadster are fitted to this chassis.

In the model 50 chassis the changes are not so numerous. The motor has, however, been increased in size from 4¾ by 5½ to 5 by 6 inches bore and stroke and the new lubricating and cooling systems employed.

FLANDERS WATER CONNECTION



The ignition is Bosch two-point system with double distributor instead of a high-tension magneto employed in the older model and Aplco starting and lighting system is added. The same bodies are fitted with an added seven-passenger body.

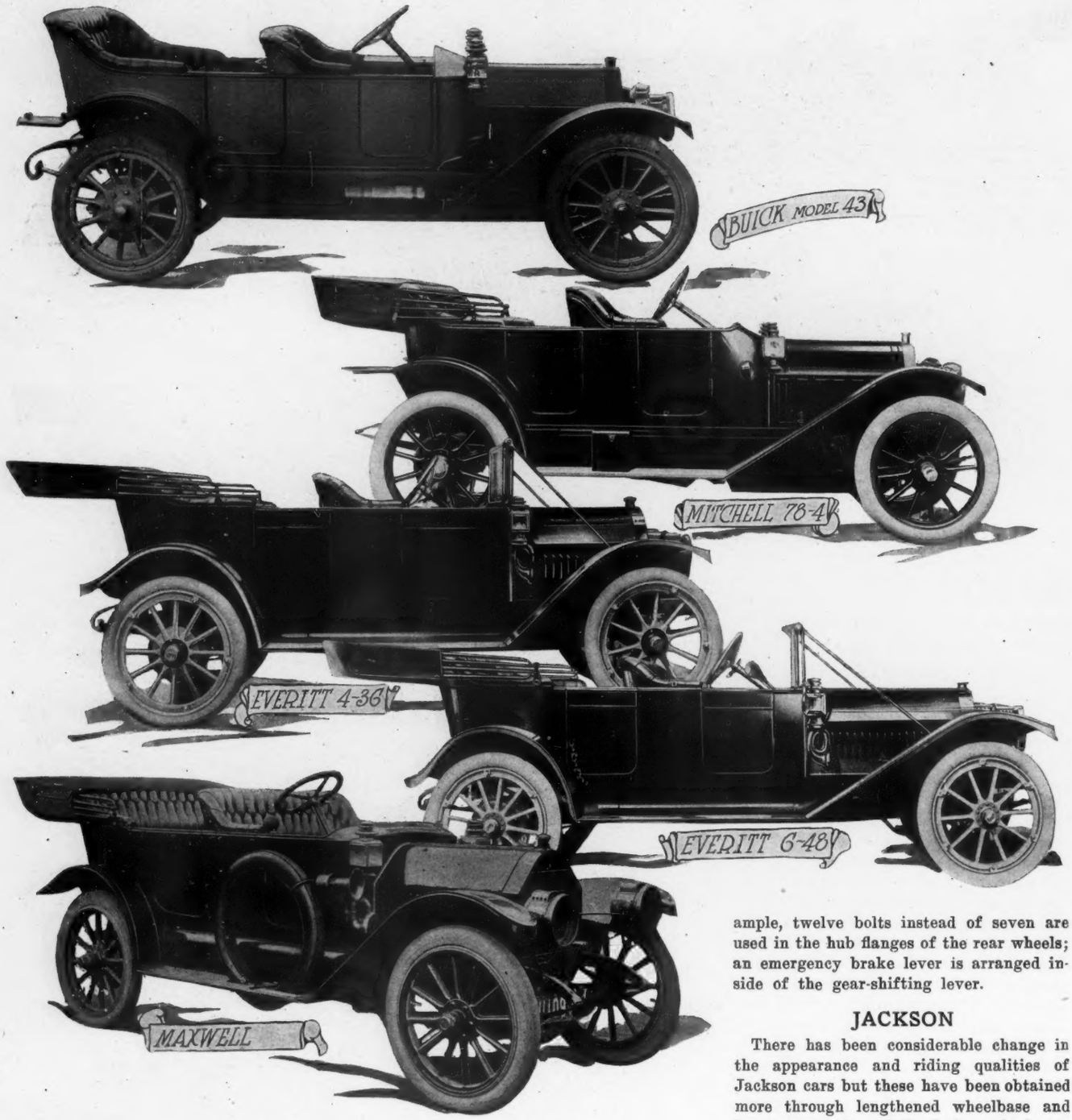
HAYNES

As last year so this with the Haynes line, namely, it is made in two models, Y which is carried over from last year without change, and 21 which succeeds 20 of last season but with many changes. Model 21 is a large chassis. The motor is 4.5 by 5.5; it was 4.25 by 5. The increase shows a tendency towards the long stroke. The wheelbase was 114 inches, it has been raised to 120. The tires were 34 by 4, and they are now 36 by 4, and in other respects this increasing in size has been carried out. By carrying the radiator 2 inches lower than formerly and by dropping the body slightly there has been considerable lowering of the center of gravity and the car appearance has been improved thereby. The intake manifold was T form and it has been changed to a Y. The oil pump last year was located between the base of the crankcase on the flywheel but now the case has been extended rearward and the oil pump is carried on the side of the case beneath the motor arm. Last year the fan pulley on the forward end of the pump and magneto shaft was in

front of the timing gear housing, this year it is back of the timing gear housing, and the fan is now carried on a lever on the front cylinder casting incorporating as it does amply provision for tightening the fan belt.

HUDSON

One chassis and six body styles is the Hudson menu for this season. The chassis in major respects remains unaltered, using the monobloc motor with transverse shaft in front, having the magneto at the right end and the water pump at the left. The chassis has grown a little and the wheelbase is now 1 inch longer than formerly, measuring 115 inches on all models except the limousine. On the torpedo and roadster chassis the motor is 8 inches more to the rear than in the standard one. Tire sizes have been increased ½ inch in diameter and demountable rims are standard. These are the changes as they may be noted by the spectator. But there have been many other changes in the way of refinements. The valve tappets are increased in diameter to give a greater life and quieter operation; the valve-spring pressure has been reduced so as to lessen wear and noise in valve operation. The oil filler pipe has been taken from the left front motor arm and mounted at the right



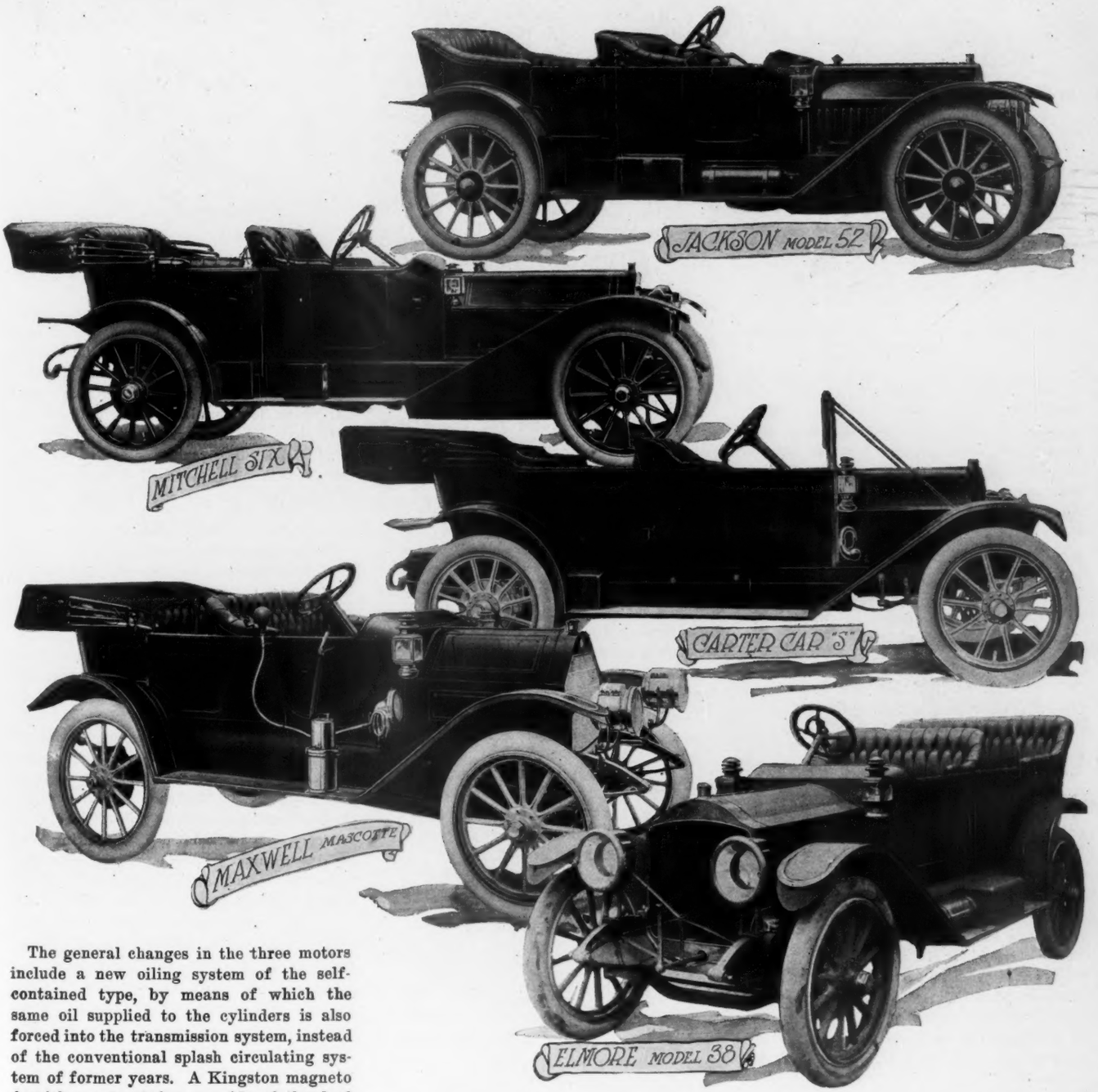
rear. Provisions have been made for draining the oil from each crankcase compartment.

On the water pump is a large marine type grease cup used to prevent leakage of water through the cup. The radiator, instead of being direct from the cross member of the frame, rests on leather pads and is attached direct to the side frame member and it has a drain plug placed in the bottom of the tank. The cylinder casting has been changed so that the intake manifold is not waterjacketed and is made of greater length, thereby giving a lower support for the carbureter. In the clutch the bronze driven disks with cork inserts have been replaced with steel stampings fitted with cork inserts. A gearset improvement is that a sump is now cast in the bottom of the case and is intended to receive any sediments or chips that might accumulate. A drain plug is provided in the sump.

The rear axle construction is heavier throughout and provisions are made for side adjustment of the differential bevel so as to correct its mesh with the pinion. The front axle is heavier and the wheels are mounted on Bower roller bearings. The tool box has been removed from under the engine hood and a bridge put in its place on which two oil cans are carried. There have been many other improvements in mechanical details and equipment. For example, twelve bolts instead of seven are used in the hub flanges of the rear wheels; an emergency brake lever is arranged inside of the gear-shifting lever.

JACKSON

There has been considerable change in the appearance and riding qualities of Jackson cars but these have been obtained more through lengthened wheelbase and lower suspension of the body and change in body lines than actual alteration in the design of the chassis or motor. So far as the motor is concerned the three models for this year are practically the same as in their prototypes of last year. The motor remains the same type that was evolved in 1908 and has not undergone since that time any change involving its basic principles. The overhead valves inclined at an angle of 45 degrees always have been a feature of Jackson construction. This design is found in the two larger models, the 52 and the 42, while in the 32 an option is offered of either the distinctive Jackson valve-in-the-head motor or a conventional L-head motor. Inclosed valves are offered on the model 38 with the L-head motor.



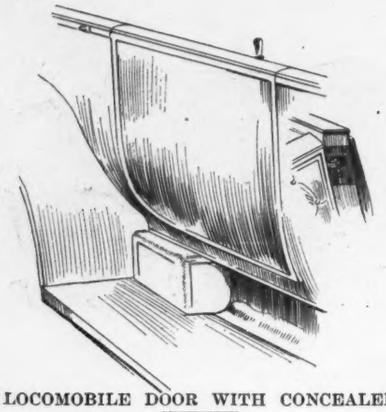
The general changes in the three motors include a new oiling system of the self-contained type, by means of which the same oil supplied to the cylinders is also forced into the transmission system, instead of the conventional splash circulating system of former years. A Kingston magneto furnishes current for one side of the dual ignition system and oil cups are fitted to all springs. Nickel and enamel trimming constitutes one of the minor changes for the year. The wheelbase has been lengthened in each case. In the model 52 it is 124 inches as against 120 inches in the model 51 of last year; in the model 32, 110 inches, an increase of 5 inches over that of last year's model 30; and in the model 42, 118 inches, as against the 110-inch wheelbase employed in the model 41 of last year.

Motor sizes remain the same, 4¾ by 4¾ in the model 52, 4½ square in the 42, and 4 inches bore and stroke in the model 32. The body fitted on the model 52 is a five-passenger touring of a true torpedo type with control levers, door handles, etc., inside. In these respects the other two Jackson touring models supplied on the 42 and 30 are identical with model 52. In addition to these are the two-passenger models in open and in closed types.

KNOX

The policy of the Knox factory for the past few years has been to pay slight attention to the annual model idea; consequently for the distinctive 1912 line there are no startling changes over the 1911 cars. During the summer of last year, however, a new model was added to the two chassis models comprising the Knox line. This is a chassis known as the model R-45. It is practically the same as the older models R and S, except that the motor has a longer stroke. The cylinders of the R-45 have a bore of 5 inches and a stroke of 5½ inches. The chassis is especially designed for closed-car service where a slow-speed motor is more in demand. Center gearshift and brake control and either right or left-hand steering are provided. With the exception of the stroke and wheelbase, 126 inches, the model R-45 is identical with the older model R.

The principal changes in the models R and S for this year are in the location of the gearshift and emergency brake levers from the right side to center, giving left-hand control. An option of left-hand steer also is offered on the model S. All the Knox cars show the same features of construction that have been their characteristics for the last 5 years. These comprise the unit power plant suspended at three



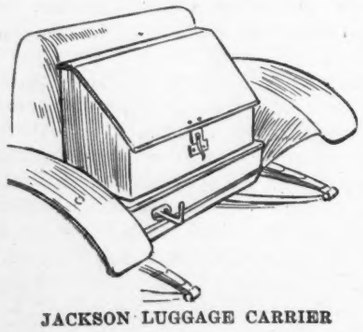
LOCOMOBILE DOOR WITH CONCEALED HINGES

points, a valve-in-head motor with the heads of the cylinders detachable, three-plate disk clutch and floating rear axle. Among the other general features are the channel steel frame, three-quarter elliptic rear springs, heavy front axle of I section, 38-inch wheels and 5½-inch bolted-on tires. The model S chassis has two different lengths of wheelbase, 106 on the raceabout and 134 inches with other bodies. The longer stroke of motor employed with model R-45 is also offered in six-cylinder form for the model S chassis.

LOZIER

The Lozier car for this year is made in two chassis types, a four-cylinder model and a six-cylinder one. Both alike in general respects and in principle of design. They use different cylinder sizes. The four-cylinder motor has cylinders 5⅜ by 6, and the six-cylinder 4⅝ by 5.5. In both of these the Lozier characteristics are used. One of the changes made is the employment of steel spirally-cut motor gears instead of rawhide gears with spur teeth, as used last year. A small plunger pump has been mounted on the left front leg of the motor to supply pressure for feeding the gasoline from the tank beneath the rear of the chassis. Exhaust pressure used to be used.

The radiator is provided with a by-pass so that water is not forced out of the overflow at high speed. The fitting of adjustable clutch and brake pedals makes the chassis more adaptable to different drivers. Better lubrication of the universal joint behind the gearset is provided by a flexible tube leading from a grease cup carried on the left side of the frame to the joint. Provision is made for carrying ignition and lighting batteries beneath the car floor at the right side of the chassis. There is an improvement in the attachment and adjustment of the front end of the radius rods and block reinforcements are inserted in the frame channels where the engine leg is attached. On the six-cylinder motor a new fan belt can be attached by simply loosening a telescoping joint in the shaft opposite the driving pulley.



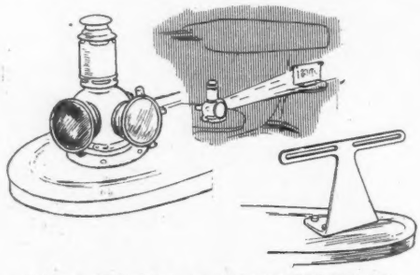
JACKSON LUGGAGE CARRIER

In the fore-door type of bodies provision is made to carry the acetylene tank half below and half above the running board. Every latitude is allowed in the matter of bodies, there being five different styles for each chassis model.

LOCOMOBILE

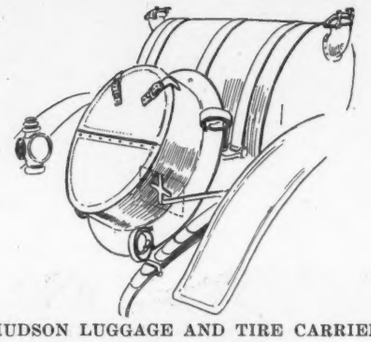
The six-48 and the little six-38 Locomobiles are the leaders for this season, although the four-30 also is manufactured. The little six has been added during the last few weeks and although new to the public, it has been under test for several months. In design it is similar to the big six. The six-cylinder 48-horsepower chassis in general lines is the same as last year, but there have been some changes. The appearance has been improved by carrying the two spare demountable rims with tires in the rear of the tonneau and by locating the tool box under the floor boards at the rear of the car.

The space under the front seat is occupied by the gasoline tank. In the body



KNOX NUMBER AND TAIL LIGHT ARRANGEMENT

the use of specially comfortable upholstery cannot be passed over. The cushioning at the back of the rear seat is 10 inches deep and the cushions forming the seat are of the same depth. Eight-inch springs are used in obtaining this result. The leading change in the car is the new rear axle in which the differential housing is a one-piece steel casting and into this are pressed the alloy steel tubes which extend outward and carry the wheel hub. A pressure of several tons is employed to press the tubes into the housings and in addition rivets are inserted as an extra precaution. Brazing is not used. The differential with pinions is formed as a unit so that by removing four bolts the entire unit can be removed. Spring shackles have been fitted with grease cups and an auxiliary oil tank located under the front seat connects by shut-off valve to the crankcase lubrication and so furnishes a supply of oil for emergencies. The company continues the use of the seven-bearing crankshaft in spite of the fact that the cylinders are cast in pairs. The upper part of the crankcase is made of government bronze which material has been used for years. The coupling between the armature shaft of the magneto and the driving shaft is a universal jaw as previously used, but it is now encased in an aluminum covering and capped with grease.

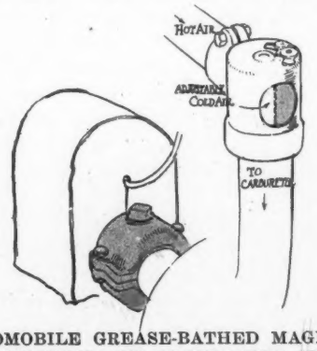


HUDSON LUGGAGE AND TIRE CARRIER

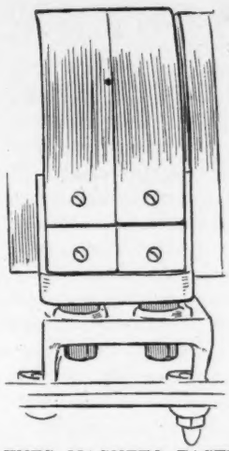
MOLINE

The policy of the Moline factory in adding improvements and making changes in its product regardless of the time of year resulted in there being little change in its product for the 1912 season. Such alterations as have occurred are more in the nature of refinements than changes in design. The chief departure in the one chassis model upon which the Moline line is built includes an increase in the size of the water circulating pipes and in the design of the radiators from the vertical round-tube type to the flat-tube type. Pushrods and valve stems are enclosed with an easily removable cover, making for quietness, and grease cups are now attached to spring shackle bolts.

The appearance of the floor boards has been improved as well as that of the running boards by the substitution of a linoleum cover with nickel plated binding strips instead of the rubber mat and plain steel running boards formerly used. Prest-O-Lite self-starting device and dash adjustment for the Schebler carbureter have been added to standard equipment. The tire size has been increased from 36½ by 3½ inches to 36 by 4 inches. The long-stroke four-cylinder motor with its 4-inch bore and 6-inch stroke is continued. The same double ignition system, splash lubrication,



LOCOMOBILE GREASE-BATHED MAGNETO COUPLING AND ADJUSTABLE AIR INTAKE



HAYNES MAGNETO FASTENING

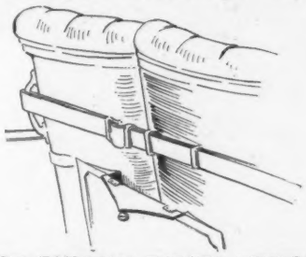
cone clutch with its cork inserts and vertical selective gearset are used this year as last, as well as the same axles, frame, steering gear and brakes. The wheelbase is 114 inches as previously. Four body models are offered, a fore-door five-passenger touring car, a four-passenger torpedo, and four and two-passenger roadsters.

MARQUETTE

Marquette motor cars are the result of a consolidation of the Rainier and Welch-Detroit interests and appear as two chassis models. The smaller model, known as the model 22-24-25-27, is the old Welch-Detroit with new types of body and more complete equipment. There is no change in the chassis itself except that the same size of tires are used on both front and rear wheels instead of larger tires in the rear as employed last year. This, combined with the demountable rims, makes tire changes easier. The four-cylinder T-head motor with 5 by 5-inch cylinders and sub-frame suspension is continued.

A Bosch dual ignition system is employed and lubrication is obtained by a constant level supply system maintained by a gear-driven pump. A 16-inch cone clutch transmits power to a selective three-speed gearset and drive is through a nickel-steel shaft with one universal joint to the ball-bearing floating rear axle. The wheelbase is 122 inches with 36 by 4½-inch tires. Four bodies are fitted, including a runabout and four, five and seven-passenger touring bodies, the chief feature of the equipment being the Vesta electric lighting system.

The model 28 Marquette, although replacing the old Ranier, is in reality a new design throughout. The motor is of the same size as that of its predecessor, being 5 inches bore by 5¼ inches stroke, with the T-head cylinders cast in pairs. The ignition of the motor is a departure from that used in the Rainier in that make-and-break ignition which was a distinguishing feature of this car, and of which it was the last exponent, has been discontinued, Splitdorf ignition being used in the new model 28. The clutch has been changed from multiple disk to cone with spring inserts. The gearset has been redesigned with a view to accessibility and it is now possible to remove it from the car without disturbing the body. It has a four-point suspension on cross members instead of being a unit with the motor. Four speeds with direct drive on the third speed. The fibre gears used in gearset of the Rainier have been discontinued, and replaced by steel gears. The rear axle is of the floating type, running on ball bearings. The front axle is an I-beam drop forging. Springs are semi-elliptic in front, with platform springs in the rear. But the spring suspension is lighter in this model than in its predecessor to give easier riding qualities. The frame is of much heavier design. The wheelbase is 119 inches with 36 by 4½-inch tires on removable rims. A Zenith carbureter, hot-air jacketed, is employed. Only one body is fitted to this chassis, a seven-passenger touring car.



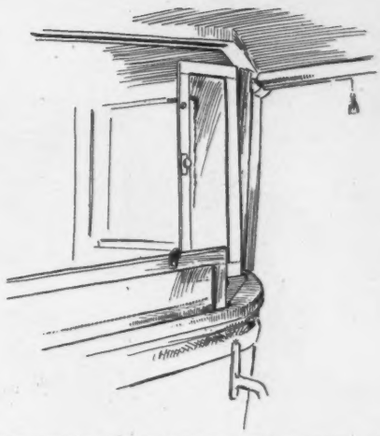
KNOX TONNEAU PARCEL ENVELOPE

MITCHELL

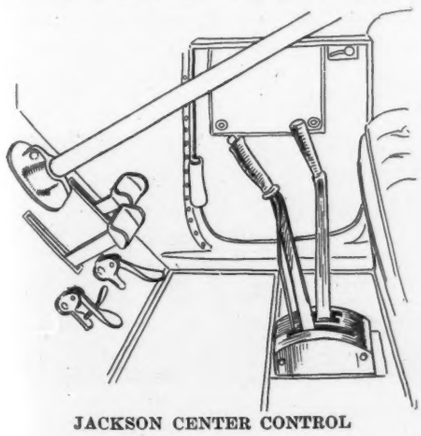
Mitchell cars this year show a radical change in design and construction from previous models. Heretofore the Mitchell has been an exponent of the valve-in-the-head motor, but the four new chassis models are of the L-head type with both inlet and exhaust valves on the left-hand side. The only valve-in-the-head motor to be marketed in Mitchell cars this year will be in the 5-four chassis which is merely a continuation of last year's model T. This model is carried through with practically no change. The four new models are known as the 2-four, 4-four, 2-six and 5-six and the 7-six. The nomenclature of the models is designed to show both the seating capacity and the number of cyinders of the motor. The 2-six and the 5-six have two bodies on the same six-cylinder chassis.

The three new motors are the same in general design, the only difference being in the size and number of cylinders employed. Models 2-four and 4-four have the same motor whose four cylinders are 3¾-inch bore by 5½-inch stroke, making it a comparatively long-stroke motor with a ratio of nearly 1½ to 1. The push rods are fitted with rollers this year and with a lock for keeping them in perfect adjustment. The valves are inclosed by means of easily removable covers, and inlet and exhaust manifolds are held in place by means of a single yoke for each pair of cylinders.

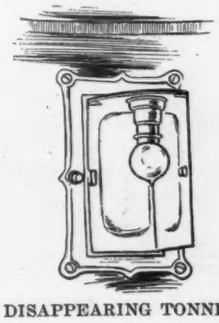
The gear-driven water pump has been placed ahead of the lay shaft gear, on the forward end of the shaft, while the rear end of the shaft couples to the magneto with the bearing between. A new magneto coupling is used, so arranged that the armature setting of the magneto may be easily adjusted. The face plate of the coupling has two slots through which project stud bolts, while the pin carrying the



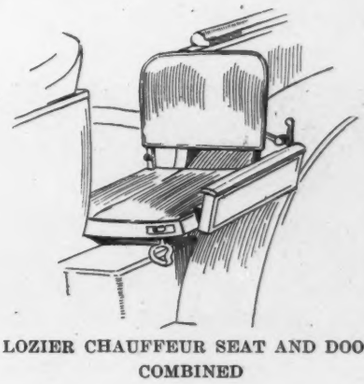
LOZIER WINDOW BETWEEN FRONT AND REAR SEATS OF LIMOUSINE



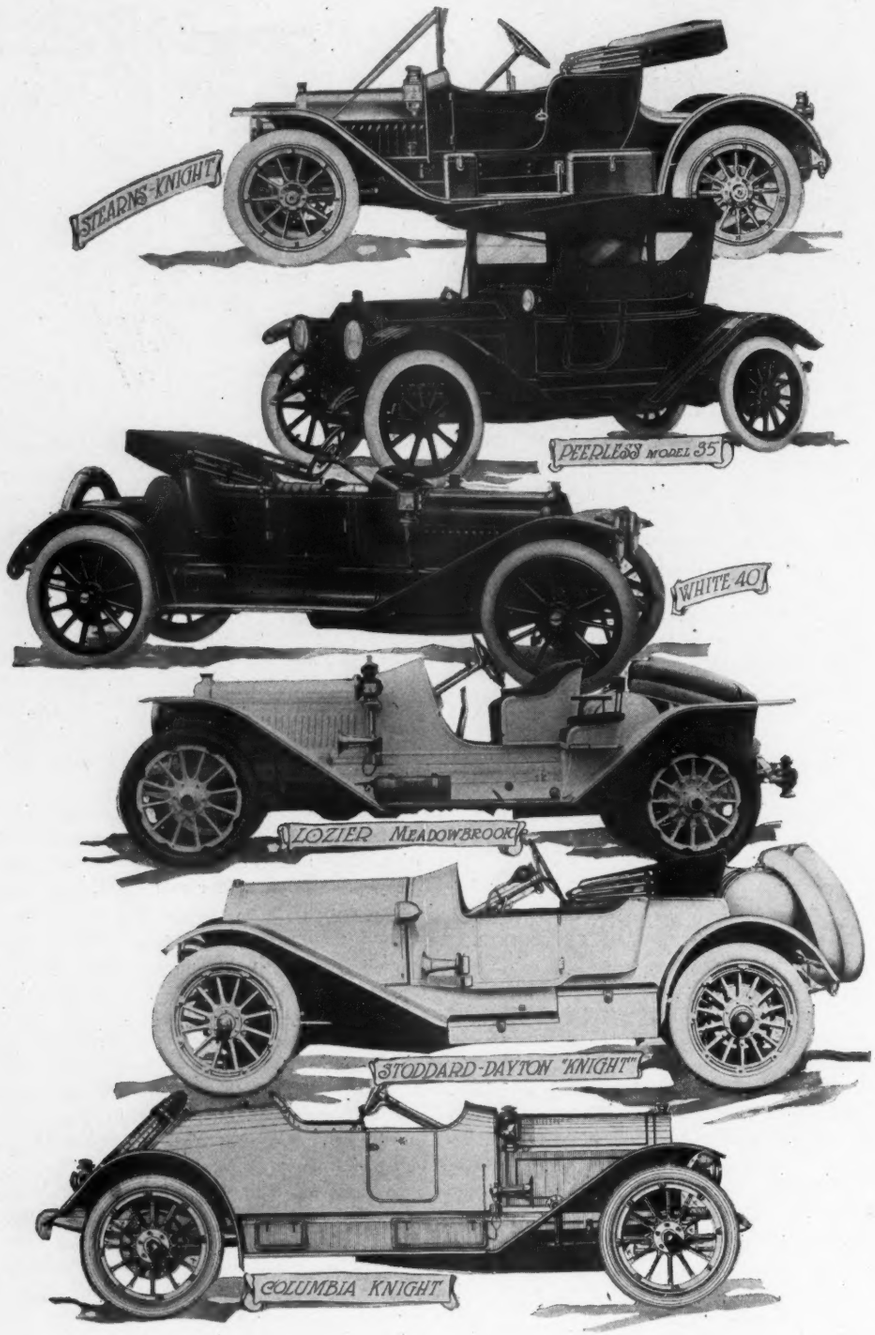
JACKSON CENTER CONTROL



LOZIER DISAPPEARING TONNEAU LAMP



LOZIER CHAUFFEUR SEAT AND DOOR COMBINED



Styles in runabouts have not shown any material departures from those to which we were accustomed last year. Fore-door bodies seem to be popular, while on some of the open-door roadsters there are found seats for the chauffeurs on the running board. Most of them also have provisions for carrying tires in the rear

spring retard holds the two halves of the coupling together.

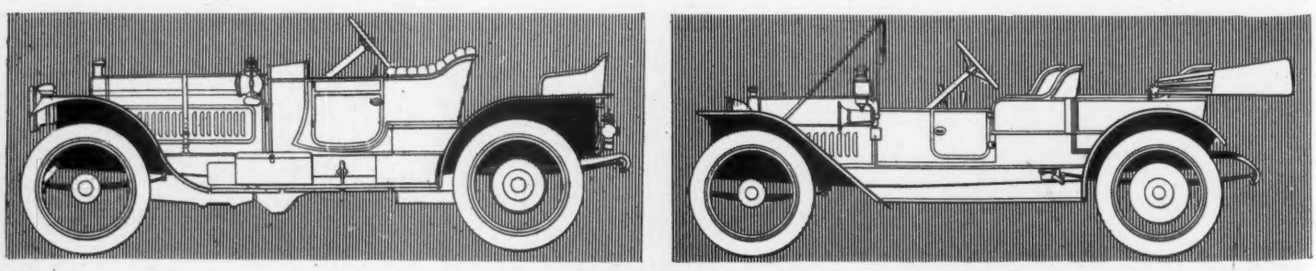
The chassis as a whole is of the two-unit type instead of the three-unit type used last year. The power unit consists of motor and clutch suspended at three points, the two rear points of suspension being bolted directly to the frame directly in front of the clutch and supported upon a pivot in front. The gearset and rear axle comprise the other unit. There has been a change making for greater accessibility in the clutch, where three coil springs are used with adjusting nuts outside of the springs instead of one with the adjustment inside as in last year's construction. Besides giving greater accessibility it also provides a smaller clutch.

There has been little change in the circulating oiling system, the chief one being in the use of an upright oil gauge instead of the circular one employed on other models. Aside from the change in the pump location the only other alteration in the cooling system is the use of a flat steel belt for the fan instead of the round leather belt used before.

Dual ignition is the same as on the earlier models, the Splitdorf magneto being retained with helical timing gears employed for the past 2 years. The gear-shift lever is solid and is hung on a ball and pin so that its end butts against the ends of sliding bars which move back and forth to shift the gears instead of the usual finger arrangement. Center control is offered with the usual right-hand steer. The control levers are placed in the center of the frame.

The axle is of the floating type instead of semi-floating and a new arrangement of the differential housing allows adjustment of the driving gear through caps on each side of the differential. The Elliott design of front axle has been adopted for 1912 so that the tie-rod is at the rear instead of in front of the axle as heretofore.

The 2-four has a four-cylinder motor with 3¾-inch bore by 5½-inch stroke, a wheeelbase of 100 inches and 32 by 3½-inch tires. The 4-four is the same chassis except for the wheelbase which is 115 inches. The 5-six and 2-six have six cylinders of the same size as the foregoing models, but with the gearset amidships instead of on the rear axle and a wheelbase of 125 inches with 36 by 4-inch tires. The model 7-six, upon which is fitted the



PACKARD SIX WITH RUMBLE AND STEARNS-KNIGHT TOY TONNEAU

seven-passenger touring body, has a six-cylinder motor of 4½ by 5-inch bore and stroke with a wheelbase of 135 inches and tires 36 by 4½ inches in size.

MERCER

As in 1911 the Mercer Automobile Co. continues its two chassis which come in four styles of body. Most of the changes are found in the touring car chassis. In the first place the motor has been given a little more power by increasing the bore ⅛ inch, it now being 4½, whereas last year it was 4⅜. The stroke is the same, 5 inches. The 4⅝ by 5 motor is the one that is used in the two roadsters, one of which is styled a raceabout and which follows the lines of the car which Hughes raced in 1911.

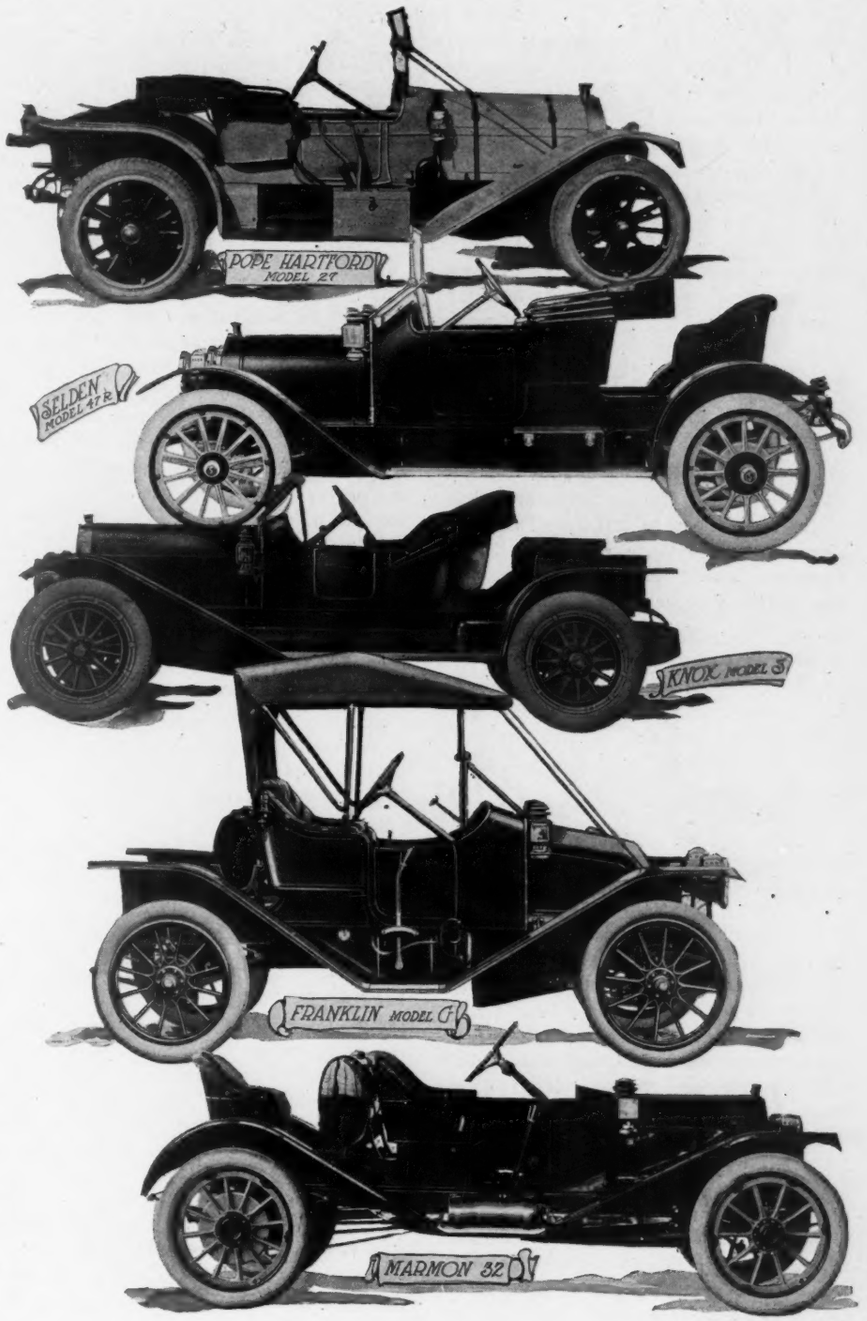
The touring car also differs from the roadster in that it has a four-speed gearset, which is something new with the Mercer. The clearance has been increased 1½ inches and in the way of ignition a two-spark Bosch magneto is being used instead of a single distributor. The wheelbase on the touring car has been increased from 115 to 118 inches, while another departure is the selling of the car fully equipped, top, windshield and shock absorbers being put on. So far as the roadsters are concerned, the company stands pat on its 1911 product.

MATHESON

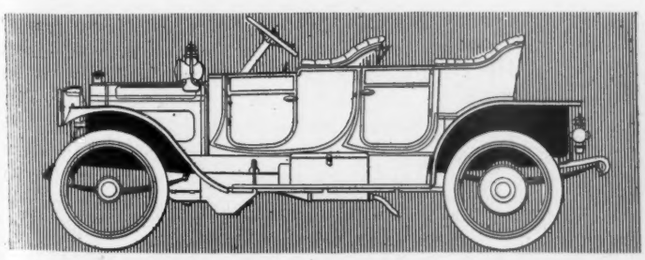
Following previous practice, the Matheson will continue to use one chassis for the six and another for the four, but there has been the addition of a new model to the six line, which, however, differs but little from the Matheson principle. The company has abandoned the idea of changing models yearly and now designates its product by serial letters, the 1912 output being designated by the title series B and C. The addition to the line is a torpedo six, with a body built by Rothschild. In this body it has been aimed to produce something racier and lower than the usual Matheson, but so far as mechanical changes are concerned, there are none. In all the Matheson bodies there has been a refining that has changed somewhat the general appearance of series B from its predecessor, the fore-door type predominating. Central control and Bosch two-independent ignition system are new.

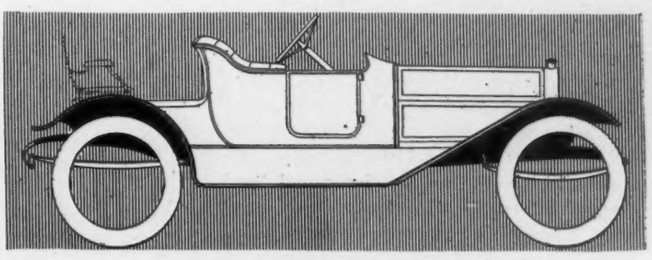
MAXWELL

A feature of the Maxwell line for 1912 is a new model designated the Maxwell Special. It is a five-passenger touring



The rumble seat still is continued by some makers, examples of this being the Knox, Selden and Marmon. On the last named the cylindrical gasoline tank is on the rear of the front seats and in front of the rumble. On the Franklin the rear deck affords space for carrying luggage which will be appreciated by the tourists

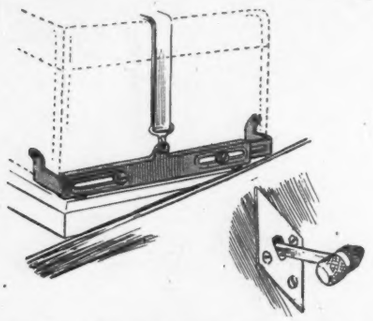




PACKARD 18 FORE-DOOR AND PIERCE-ARROW ROADSTER

car which bears few if any external resemblances to previous models and incorporates not a few features, including a new self-starter. The Special uses a new motor which leans to the long-stroke type, the stroke-bore ratio being 1.23 to 1, the stroke being almost one-fourth in excess of the bore. It is rated at 30 horsepower. Apart from the motor this model has many new features, the body of the fore-door design with doors on a level with the top of the body. Conventional right-hand control is employed. The emergency brake and change-speed levers are inside and placed to the right of the driver.

The general body lines are quite different from previous Maxwell types, and this difference is accentuated by the new Columbia type of square-tube radiator which is without the horizontal cross band of brass which up to this time has been a distinguishing feature of Maxwell cars. There are many changes that do not appear on the surface or on a casual glance



LOCOMOBILE ADJUSTABLE TRUNK HOLDER AND KNURLED PEDAL

at the interior. The rear axle is a floating type in which the axle drive shaft can be withdrawn by removing the rear wheel hub caps, the axle housing taking the entire load. The front axle is an I-beam drop forging, a Stromberg carbureter with glass float chamber is furnished, and rear springs are three-fourths elliptics with scroll ends. The wheelbase measures 114 inches, tires are on quick detachable rims, and the equipment includes gas headlights with generator, oil, dash and tail lamps, horn, robe rail, etc.

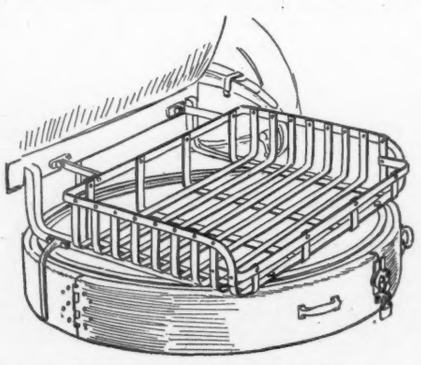
In addition to the Maxwell Special there are three other models known as the Mercury, Mascotte and the Messenger. These names are used instead of meaningless letter and figure combinations. The Mercury is a four-cylinder roadster whose body has flush-sided doors and new dash ventilators. Like the Special it uses the new radiator design and hood of corresponding lines. Demountable rims are fitted; and the motor uses a high tension racing magneto and Stromberg carbureter. The Mascotte is practically a continuation of the model I; and like the other two models it has the new radiator and hood design, has a ventilated fore-door body with control levers inside, irreversible worm-and-sector steering gear springs of special English steel. The Messenger model is the little two-cylinder car with its motor clutch and gear set combined which has remained practically unchanged for 5 years.

MARMON

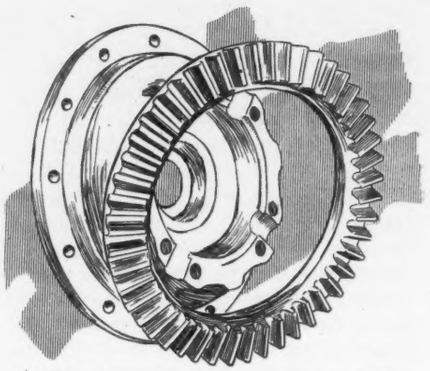
The Marmon 32 chassis is continued for next year in much the same general form as heretofore but with many minor improvements. The motor dimensions have not been altered but a two-spark Bosch ignition system is fitted with spark plugs carried in the valve caps. An addition to the Marmon non-splash oil system is that the pump feeds direct to the two front camshaft bearings, a lubrication feature which is being largely followed for this season. Greater accessibility of the valves is obtained by having the intake water pipe enter the casting horizontally instead of at an angle of 45 degrees. In this way the water pipes are higher than formerly. An air adjustment for the carbureter is now mounted on the dash. Spark and throttle levers on the steering column work on a tooth-segment instead of on a friction one. Clutch operation has been facilitated by shortening the clutch rocker shaft and supporting it at the left end from a bracket on the cross member of the frame. This frees the shaft from any strains occasioned by twisting of the frame.

Several rear axle improvements have been made. An entirely new bevel gear differential of Marmon construction is used. The bevel gear on the differential is simply a ring of teeth which bolts to the differential casting. This gear has been made in a ring form in order to reduce the amount of metal in it and consequently reduce the amount of vibration in the gear when running. This has all been done with the object of getting a quieter axle. A neat method is provided to adjust the pinion with reference to the differential bevel: The pinion shaft is carried in a ring which threads into the housing. The outer face of this ring is serrated and meshes with a worm, the upper end of which extends through the differential housing. By turning this worm the adjustment can be effected from the outside.

Larger tires are fitted and demountable rims are stock equipment. Several steering changes have been made: There now



KNOX LUGGAGE AND TIRE CARRIER



MARMON METHOD OF SILENCING BEVEL DRIVE GEAR

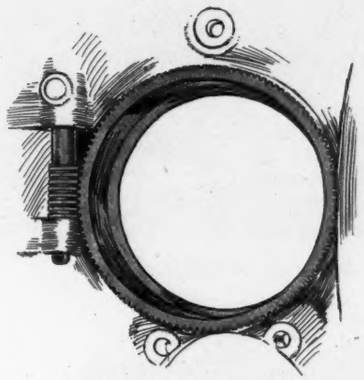
is a support for the steering column at the dash; a race of Shaefer ball bearings in the top of the steering yoke carries the car load; a hardened pin is used to secure the end of the tierod to the steering arm, the eye hole in the arm being bushed; and the end of the tierod is threaded and clamped for adjustment. Brake drums are increased in size and adjustable stops fitted to regulate brake operation.

M'INTYRE

A feature of the McIntyre line for 1912 is the model F 12, which greatly resembles the model A5 of 1911 except that its stroke has been increased from 4½ to 5 inches. The thermo-syphon cooling system of the motor has been displaced by a forced circulating system having a centrifugal pump. A Briggs magneto is the feature of the dual ignition system. The wheelbase has been increased from 110 to 114 inches; tires are increased from 32 by 3 to 34 by 3½ inches and fitted on demountable rims. Other features of the 1912 McIntyre car are a four-cylinder motor with a 4-inch bore and 5-inch stroke, having separately cast T-type cylinders and a circulating oiling system. A multiple-disk clutch transmits the power from the motor through a propellor shaft inclosed in a torsion tube to the three-speed selective sliding gearset which is in unit with the semi-floating rear axle. The frame is of pressed channel steel mounted on semi-elliptic front springs and three-quarter rear ones. The front axle is an I-beam drop forging.

MOON

For the season of 1912 the principal product of the Moon is the model 40. This being the new model brought out late last fall, it contains all the new and modern features and yet is a development of the Moon model 30 as well as the most popular features of the model 45. The chief differences between the new model 40 and the model 30 of 1911 are that it is equipped with a self-starting mechanism; has its transmission gearset located amidship instead of in unit with the rear axle; the rear axle is a floating type instead of semi-floating as on the model 45; the tires are larger, being 36 inches by 4 inches;



MARMON METHOD OF ADJUSTING THE DRIVING BEVEL

and the wheelbase is considerably longer, being 120 inches. In the model 40 motor all the bearing caps are held with four bolts instead of the usual two; the valves have been enlarged, being now 2¼ inches in diameter and interchangeable. The self-starting mechanism is a Disco construction operating in connection with the acetylene gas tank.

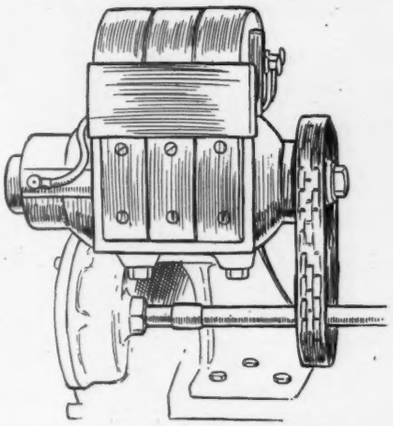
The model 40 rear axle is without the usual driving dogs on the end of the drive shafts, the driving shafts and wheel flanges being all one piece and comprising the entire driving mechanism. The pinion shaft is mounted in Timken roller bearings and large high-duty Hyatt bearings are located immediately under the spokes of each rear wheel. Mechanically, the models 30 and 45 remain unchanged for 1912 except that in the model 30 the wheelbase is lengthened from 114 to 116 inches; the motor is a trifle larger, having a 4½ by 5-inch bore and stroke instead of 4⅜ by 5 and 34 by 4-inch tires are employed instead of 34 by 3½.

NATIONAL

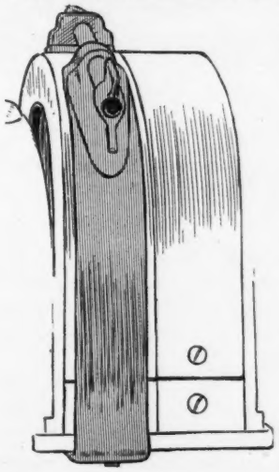
To meet a demand for a long-stroke motor the National Motor Vehicle Co. has added to its line a chassis with an engine with a 4⅞-inch bore and 6-inch stroke which will come in two body styles, one a roadster and the other a touring car, which, however, do not differ in detail from the well-known National 40 with the 5 by 5 11/16-inch motor. The newcomer in the National line, outside of the engine, greatly resembles the 40 except that its wheelbase is longer, the measurement being 128 inches, whereas the 40 is 124. Another departure, too, is center control with the steering either right or left, as desired by the purchaser. The other features of the National motor, the lubrication, cooling, etc., have not been changed in the least from the 40 pattern except that the bore has been dropped from 5 to 4⅞ and the stroke lengthened from 5 11/16 to 6 inches.

The 40 line is identically the same as in 1911, there being no changes whatsoever in a product that has stood the test of the year. This line is known as series S and there is a wide choice in body styles, there being no fewer than ten types offered in this connection.

The National always has been a strong supporter of racing and in consequence of this it has a special long-stroke motored speed car which it does not catalog, but which it builds to order. This is a 5 by 7½ engine which has the cylinders cast in pairs. The exhausts are in a pocket on the left side and the intakes are placed in the head. The valve diameter is 3¼ inches. The National company will not build a six, despite rumors that have been heard.



MARQUETTE GENERATOR



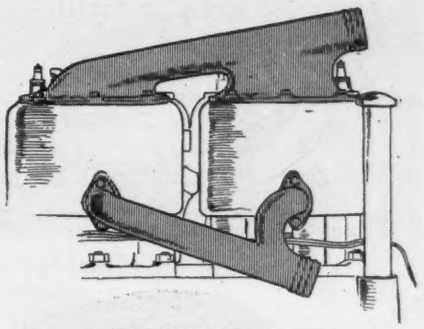
MAXWELL MAGNETO FASTENING

OLDSMOBILE

Following the practice of the past few years, Oldsmobile cars appear for this season in three chassis models, the Autocrat and the Limited being carried over with only minor changes and the Defender taking the place of the Special. The Defender model is a different design throughout from the Special.

The new chassis model, the Defender, has a four-cylinder motor of very long stroke, the dimensions being 4-inches bore and 6-inches stroke, a stroke-bore ratio of 1½ to 1. The wheelbase is 116 inches with 36 by 4-inch tires. In all other respects the chassis corresponds with the other two models. Four bodies are fitted to it—a touring, tourabout, roadster and coupe.

The changes in the Autocrat and the Limited models appear chiefly in the matter of equipment. However, the motor has been fitted with a compression release operated by cams on the exhaust camshaft by which the exhaust valves are raised slightly from their seat to relieve compression in starting. The Limited is fitted with Bosch two-point ignition instead of the double ignition used last year.

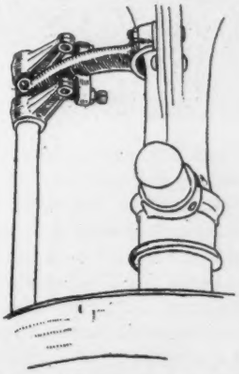


MOLINE WATER PIPES

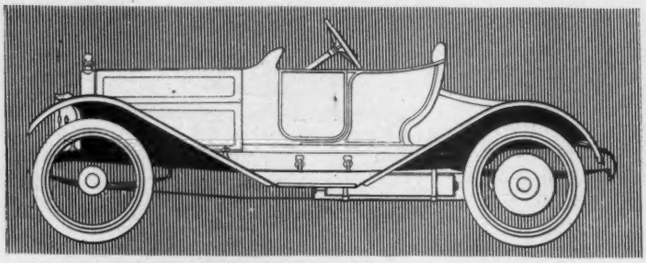
The changes in body design apply to all models and consist of fitting ventilators to the fore-doors and finishing caps on the hubs by which the hub caps are made to extend above the base of the spokes to cover the bolts. In addition to wiring the bodies for electric lighting, an automatic gas-lighting system is installed, the control valve of which is a needle valve to prevent leaks in place of the usual shut-off cock. All the bright metal work about the car is finished in nickel. The tourabout body has a cast aluminum dash into which the side lamps are sunk.

OAKLAND

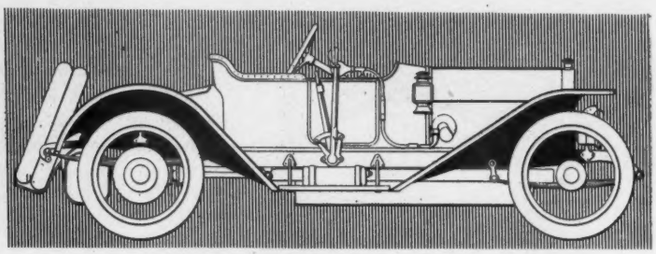
As for the changes in the line for 1912 the Oakland has discontinued the manufacture of its 1911 model and enters the field with two new models whose characteristic features are quite clearly given in the specification tables published herewith. The most marked difference between the 1912 model 40 and the K special of 1911 is that the model 40 has a larger motor, a cone clutch instead of a multiple-disk and three-quarter instead of elliptic springs. Other characteristics of this new model not shown in the specification table are the three-point suspension of the unit power plant and its inclined position in the frame to bring about a straight line drive; the propeller shaft is inclosed in a torque tube which is reinforced by



MARMON BRAKE ROD ADJUSTMENT



THOMAS TWO-PASSENGER ROADSTER



MERCER FORE-DOOR RUNABOUT

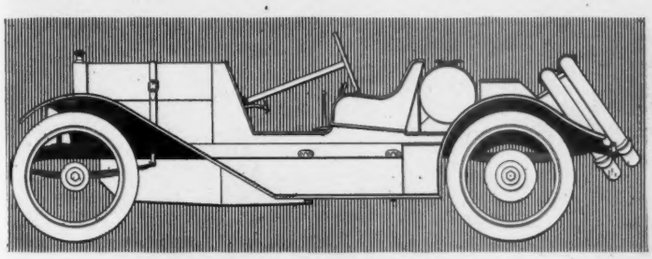
Two-passenger roadsters continue to hold their popularity, but in most cases they are equipped with fore-doors and carry top and windshield

diagonal radius rods; adjustable driving gear bearings are provided in the rear axle; brake rods are arranged inside the frame; and control levers are inside of the body.

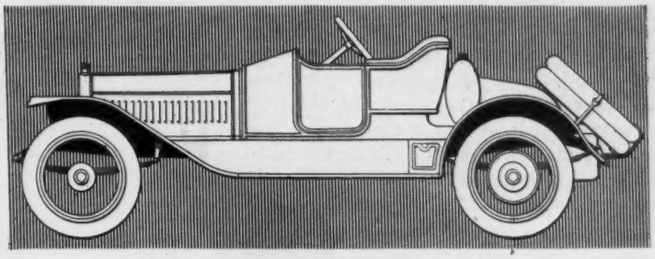
The design of the new model 30 is practically identical with that of the 40 except that it is smaller and of lighter construction throughout. The new model 45 differs from both the 30 and 40 in that the motor is larger and is equipped with a Bosch magneto; the propeller shaft has two universal joints and a pressed channel steel torque member; the frame is a double drop design narrowed in front of the dash; tires are larger and the wheelbase longer and demountable rims are fitted as regular equipment. As for the new body types, the feature of the line is the sociable roadster which differs entirely from the conventional motor car body design in that it seats three persons side by side without crowding the driver. The seat is 46 inches wide.

OVERLAND

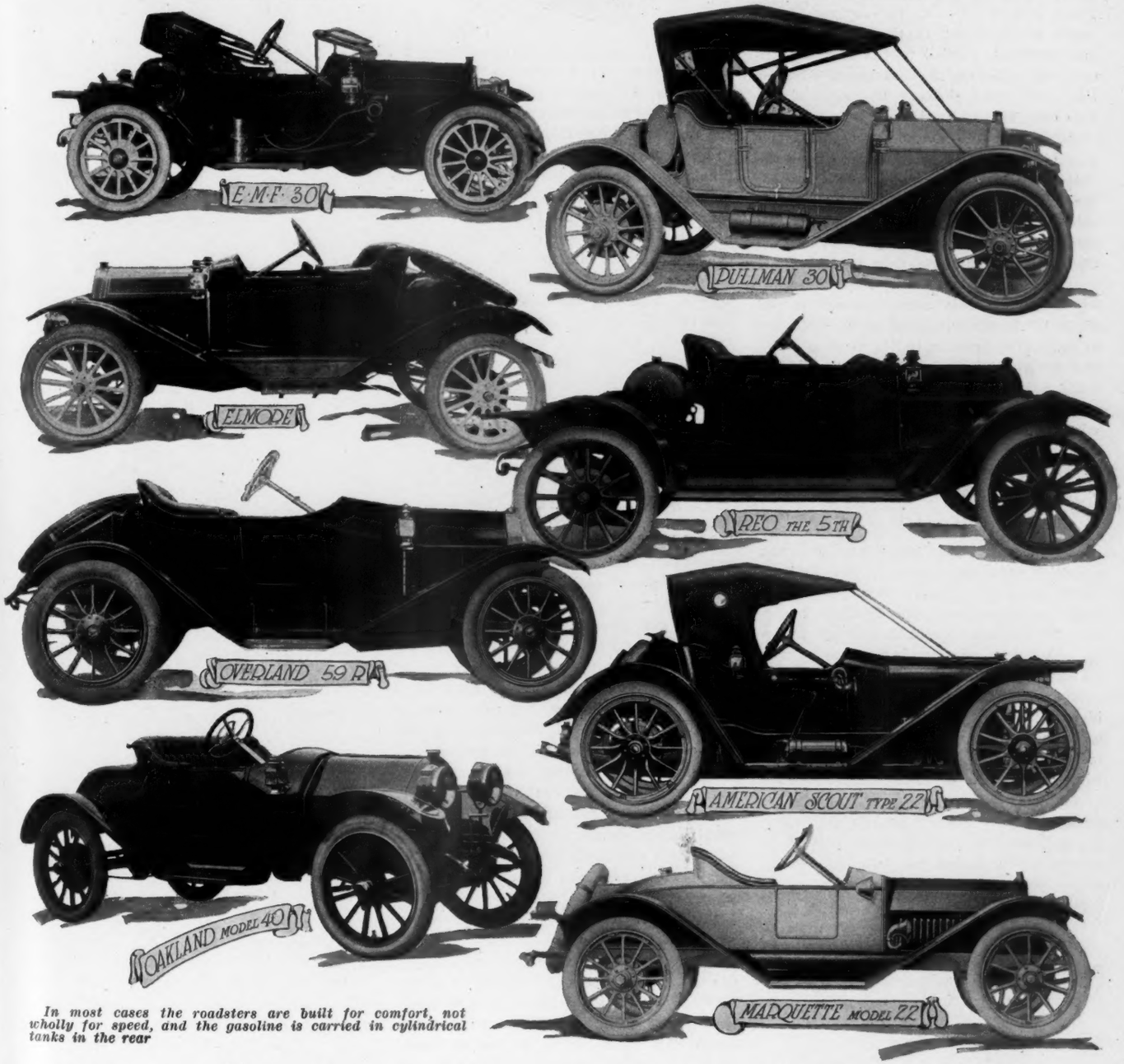
The Overland line is reduced to four chassis models, namely 58, 59, 60 and 61. These are sub-divided for roadster, touring car and coupe. On all of these fore-



SPEEDWELL SPEED CAR



WINTON SIX RUNABOUT



In most cases the roadsters are built for comfort, not wholly for speed, and the gasoline is carried in cylindrical tanks in the rear

door bodies are used with the steering column on the right side but the emergency brake lever and change-speed lever are in the center of the floor boards to be operated with the left hand. All four chassis are four-cylinder types with the gearset and rear axle a unit. The motors are still of the individual casting type with the valves on the left side.

Thermo-syphon cooling is employed on all and for this year the aluminum intake and return waterpipes have been increased in efficiency from 25 to 75 per cent. Using separate cylinder castings permits of the regular use of five-bearing crankshafts in all models. The oiling system remains the same, namely, a mechanical oiler on models 58 and 59, and a circulating system on models 60 and 61.

All models, with the exception of 58, have a three-speed selective gearset. Model 58 is a two-speed planetary. A motor improvement is inclosing the exposed ends of the valve tappets and valve stems. This has been done by a cylindrical covering formed in halves, and these held together by spring clamps. An important valve improvement is a packing at the lower end of the valve stem guides. This packing is contained in the coned

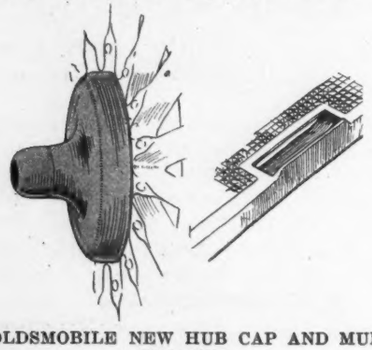
end of the guide and is held in place by a steel washer which is in turn supported by a spring surrounding the valve stem. In order to prevent oil leaking out from the upper ends of the tappet guides, due to the pumping action of the tappet in its bushing, two vertical oil return grooves are cut in the bushing, and at the top of these grooves is an annular space surrounding the tappet. The oil lifted by the tappet collects in these grooves and flows downward. A prevention of oil leaks is important in the Overland line and has been carried to the rear axle in order to eliminate the leakage of oil from the differential through the end of the axle onto the brake drum.

On models 58, 59 and 60 a packing is held between two steel washers within the axle housing. One washer rests against the end of the axle tube and the other is held against the packing by spring. In model 61 a genuine stuffing box construction is used and the axle driveshaft is ground where it passes through the stuffing box. In this way leaking is prohibited. Provisions have been added for adjusting the pinion in its meshing with the differential gear. Wheels have been made heavier on all models. On model 61 a new form of gear-shift is employed which eliminates the side movement of the lever, an important feature where these levers are placed between the passengers of the front seat.

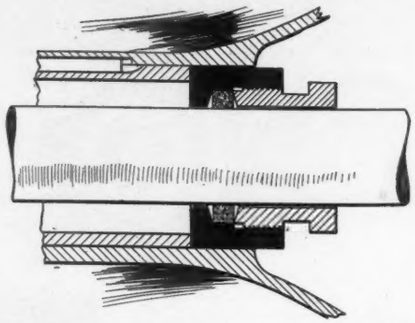
OHIO

The Ohio line for 1912 comprises seven styles of cars, six of which are built on a standard chassis design and the seven a racytype known as a speedster on a special chassis, which with a few exceptions also resembles the standard chassis. The standard 1912 Ohio chassis is merely a development of the 1911 model and is almost identical with it except that for 1912 the motor has a bore and stroke of 4½ and 4¾ inches, a Bosch dual magneto, and the wheels are increased from 34 to 36 inches in diameter and equipped with quick demountable detachable rims. By increasing the cylinder dimensions, which previously were 4 by 4½ inches, the motor is claimed to be increased in power from 33 to 40 horsepower.

One of the characteristic features of the Ohio cars for 1912 is a combined motor, clutch and gearset, from which



OLDSMOBILE NEW HUB CAP AND MUD SCRAPER



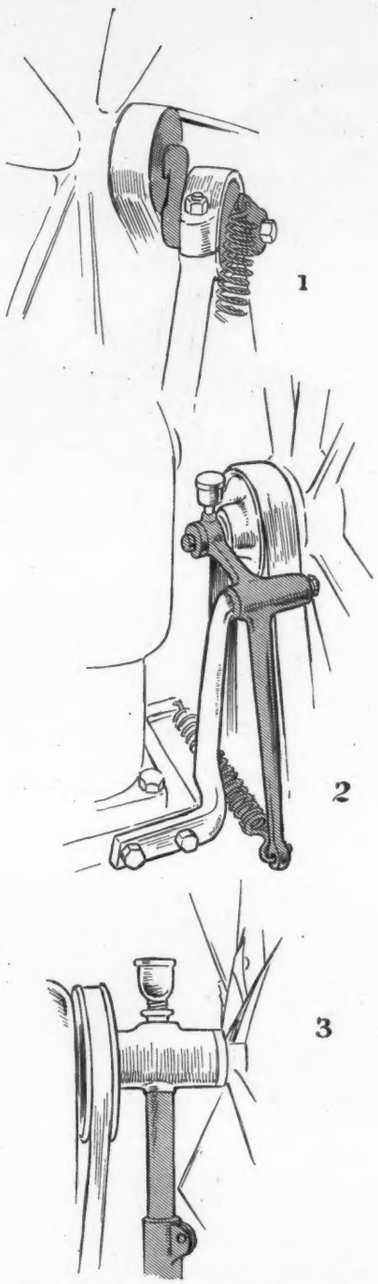
OVERLAND REAR AXLE GREASE PACKING

power is transmitted from a propellor shaft with two universal joints to a floating rear axle. The front axle is an I-beam dropped forging. A pressed channel steel frame is employed, and the latter is mounted on semi-elliptic springs front and rear. The features of the unit power plant are a T-type motor with its cylinders cast in pairs, a multiple-disk clutch, and selective gearset giving three forward speeds. The new speedster model is similar to the standard model in design, but the motor has a 4 1/16-inch bore and 4¾-inch stroke; it is equipped with a double distributer magneto, has an additional hand oil pump and auxiliary oil supply tank; the wheelbase is 105 inches; tires are 32 by 4 and mounted on racing rims, and the rear springs are 43 inches long and 2¼ inches wide.

PEERLESS

The Peerless line of motor cars for the season of 1912 has been increased from three to five chassis models by the addition of two new chassis with six-cylinder motors rated at 38 and 40 horsepower. It has been the policy of the Peerless company to make any little changes or improvements from year to year that would add to the comfort of the passengers or to the convenience of the operator and in concurrence with this policy the most notable feature among the changes for 1912 is the adoption of the Gray & Davis electric lighting system, in which a constant-current dynamo driven by belt from the pump shaft of the motor furnishes current for the head, dash, side and tail lights.

Instead of a barrel-type crankcase in which the crankshaft is inserted through an opening in the end of the case, all of the new six-cylinder motors have seven instead of four main bearings, which are strapped in a conventional manner to the upper half of a horizontally-split crankcase, the lower portion of the case simply acting as an oil pan for the splash lubrication employed. The sub-frame which in 1911 cars supports both the motor and gearset is dropped in the 1912 construction and the motor is suspended direct from the side members of the main frame by two I-beam drop forged cross-members, while the gearset rests on an individual sub-frame suspended from two heavy channel steel cross-members ar-

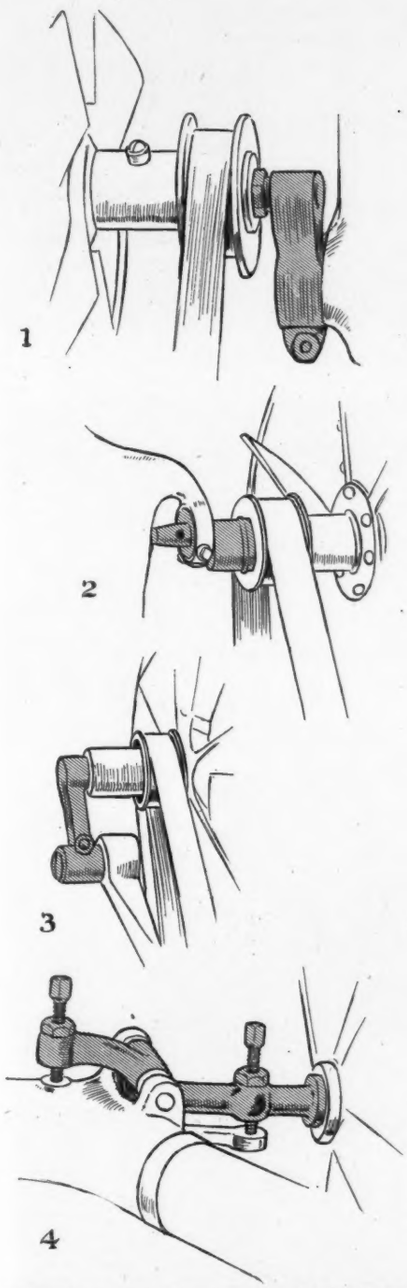


METHODS OF FAN BELT ADJUSTMENT —1, OLDSMOBILE; 2, STEARNS; 3, PULLMAN

ranged amidship of the main frame.

Another new feature of the six-cylinder models for 1912 is that at a nominal extra charge the car can be made for left-hand drive instead of the conventional right-hand. To make this possible, the oiler no longer is cast integral with the crankcase of the motor, but is a separate unit with the crankcase adapted for its attachment on either side. In addition to this change in the oiling system, troughs or cups now are arranged near the lower ends of the connecting rods to facilitate the lubrication of the crank pins.

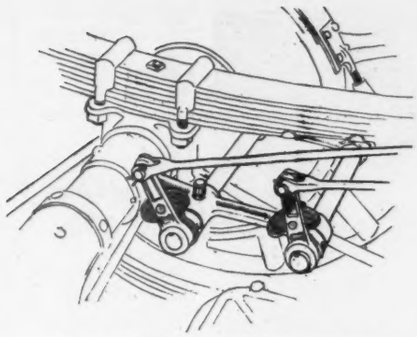
The Bosch double-synchronized ignition system has been adopted, which comprises two independent systems, including two sets of spark plugs, a high-tension mag-



METHODS OF FAN BELT ADJUSTMENT —1, HAYNES; 2, REO; 3, MARQUETTE; 4, MAXWELL

neto and storage battery as current sources, and a single unit coil of the vibrating self-starting type arranged on the dash so that only the face of it is visible. This does away with the more bulky dash coil employed with the previous system. There also is a change in the carbureter and intake manifold design of the new cars.

About 33 per cent of the chrome tan leather facing of the expanding clutch is occupied by cork inserts; the brake control shaft now crosses the top of the change gearcase, necessitating slight changes in the shape of the removable inspection plate; improvements have been made in the spring design by increasing the number of leaves and making them



OVERLAND BRAKE ADJUSTMENT

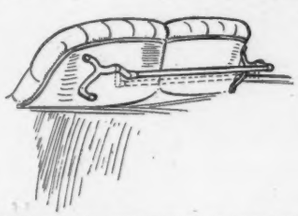
thinner so that now they are slower acting and more shock absorbing; in the six-cylinder 60-horsepower car the valves have been increased from 1⅞ to 2¼ inches in diameter.

PIERCE-ARROW

People have been accustomed to three Pierce-Arrow models annually, and these are continued for next year with the same names. Six-36, Six-48, and Six-66. The motors in the first two have not been changed, but in the 66 the measurements are 5 by 7 instead of 5.25 by 5.5 of 1911. This gives a long-stroke motor, the stroke-bore ratio being 1.4 to 1. This is one of the few examples of American cars in which the bore of last year has been cut down and the stroke lengthened.

The bodies of all three chassis are radically different from last year. They are all fore-door flush-side creations with change-speed and emergency brake levers inside the body. In order to get these inside, the body at this point had to be widened, which was accomplished by overhanging the body sills on the frame members. This was accomplished by placing extension plates on the frame at this point, these plates supporting the body sills. The use of fore-door bodies necessitated ventilators which take the form of hinged doors in the baseboard of the windshield. On all of the twenty-one body types the running board has been left clean by suspending the batteries beneath the body. An addition to the oiling system is a special lead to the timing gear housing of the motor and also to the front end of the magneto shaft.

The demand for electric lighting has resulted in providing four bosses on the left rear of the crankcase to which a support for an electric generator can be attached. Provision is also made to drive this through a clutch coupling with the rear end of the pump shaft. Starting is facilitated by the priming equipment



OLDSMOBILE FOLDING COAT RACK

which, by means of a pump on the dash, gasoline is sprayed into the manifold through a special nozzle. A compression relief is provided on the six-66. The use of a double ignition set is continued. Gear-shifting has been facilitated by the addition of two disk-shaped clutch brakes which bear upon the face of the cone clutch when it is drawn rearward for disengagement. These disks slow down the spinning of the cone and prevent grating of the gears.

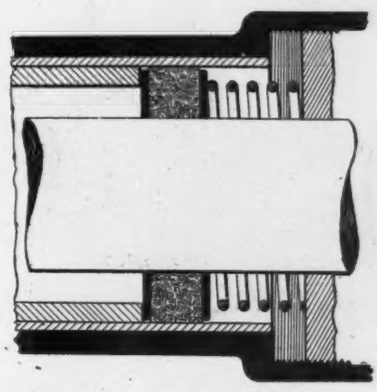
PACKARD

The most important Packard change is the adoption of a six-cylinder car which was put on the market in the middle of the summer, and which is being produced in conjunction with the models 18 and 30 which have been the Packard mainstay for years. The six incorporates many new features of design in the motor. It uses twin-cast cylinders with opposite valves, but employs a three-point suspension, a trunnion in front and rigid supports on the side frame members at the rear. Instead of the three-part Packard crankcase there is a two-part casting which is continued rearward and entirely incloses the dry-disk clutch and flywheel and it is continued further to the rear, forming a bearing for the rear end of the clutch shaft.

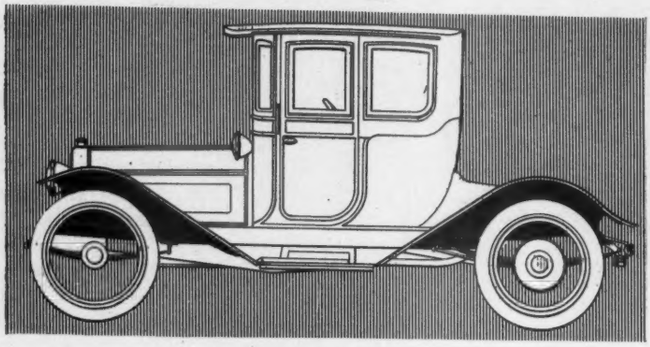
This motor differs from previous Packard types in that it uses a non-splash circulating oiling system. The lower crankcase has 1-gallon oil capacity and a gear pump delivers this oil to the four crankshaft bearings, to the two front camshaft bearings and to the magneto shaft bearings. By drilling the crankshaft oil is led to the six lower connecting rod bearings. In addition to the crankcase supply a 1.5-gallon auxiliary oil tank is carried on the left side of the crankcase and feeds by a vacuum flow into the case.

A change in the ignition system is the adoption of the Bosch high-tension dual outfit. The rear axle is made as a unit with the gearset, but differs in construction in that the gearbox is a detachable unit and the differential housing a one-piece oval-shaped casting. Heretofore, the gearbox was a unit with one-half of the differential housing.

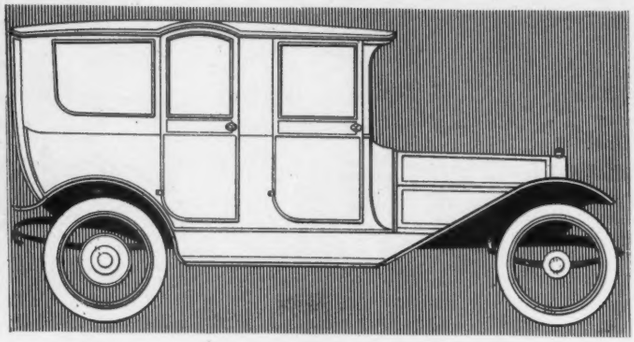
Few changes have been made in the



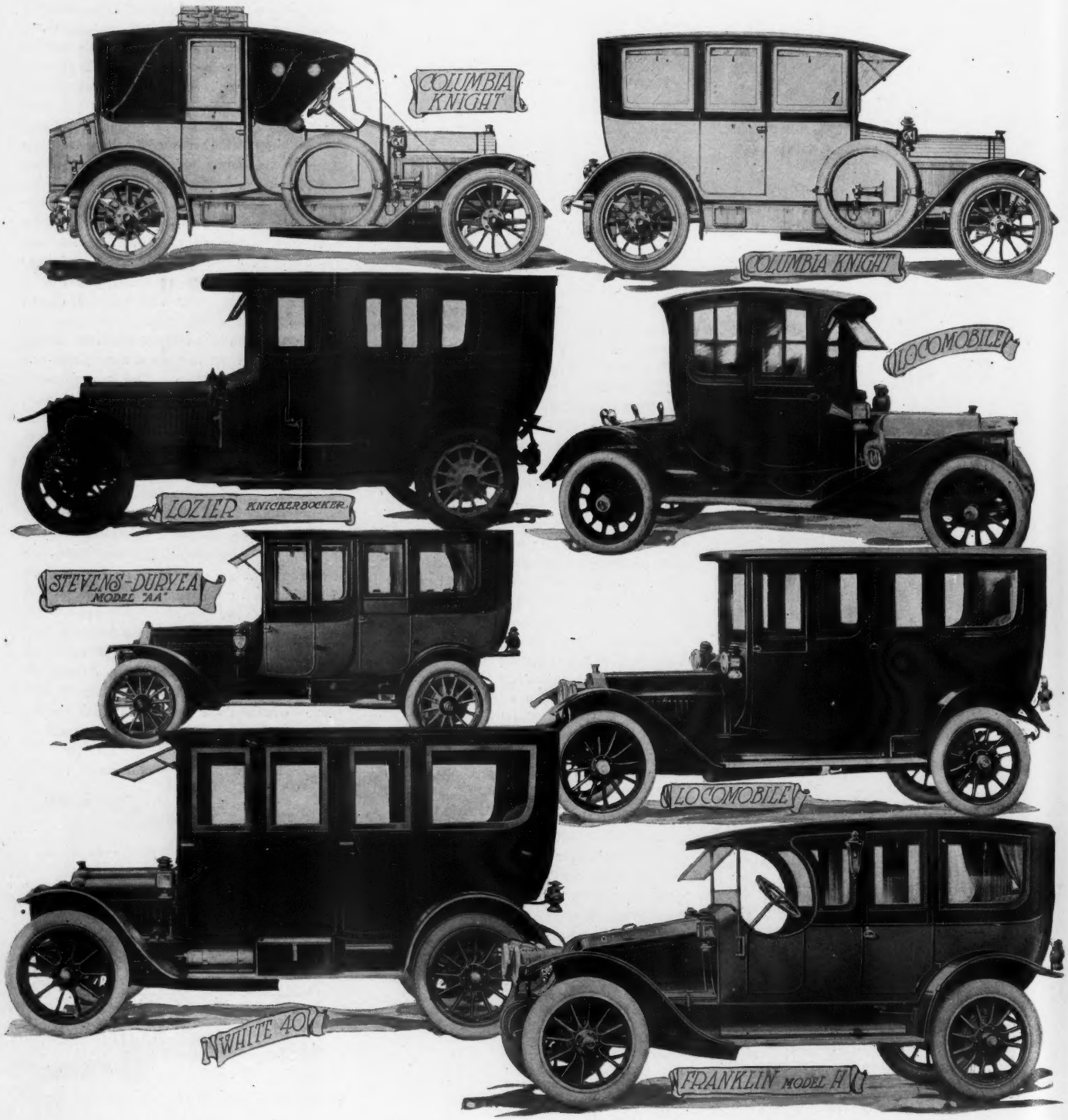
OVERLAND REAR AXLE PACKING SCHEME

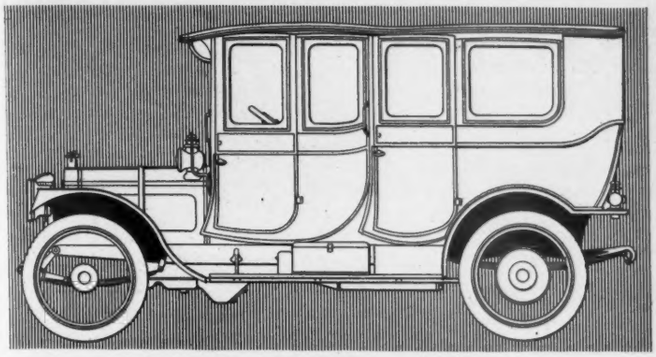


PEERLESS COUPE

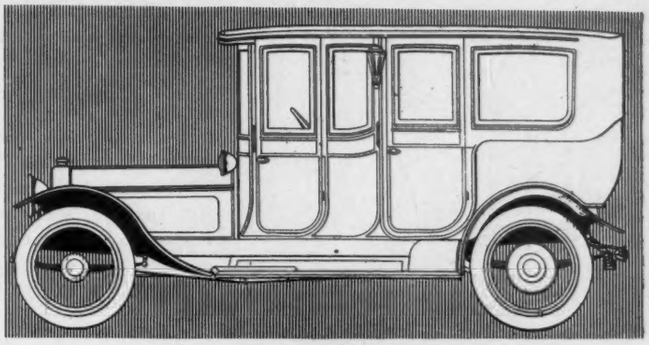


PIERCE-ARROW 66 SUBURBAN

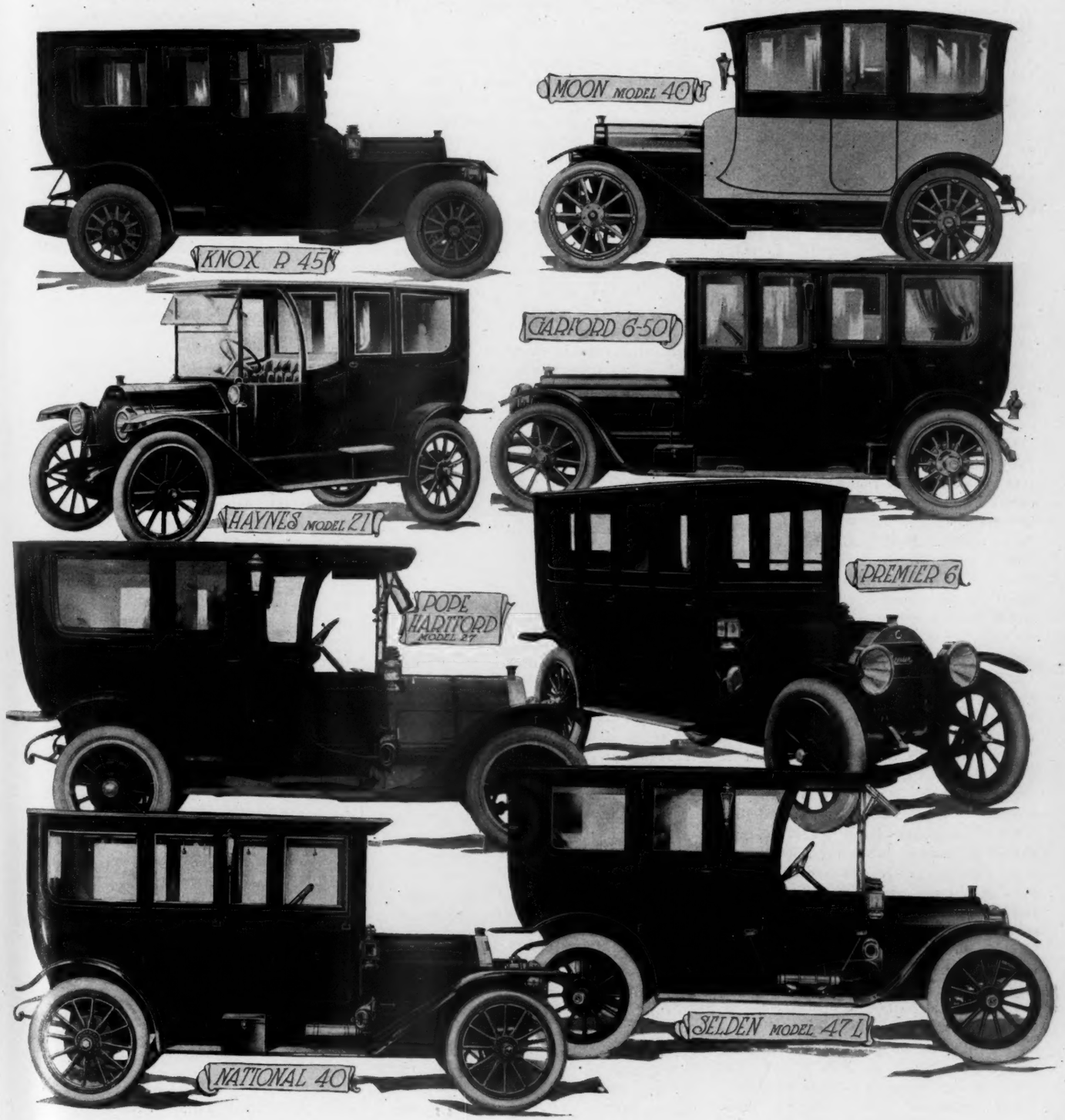


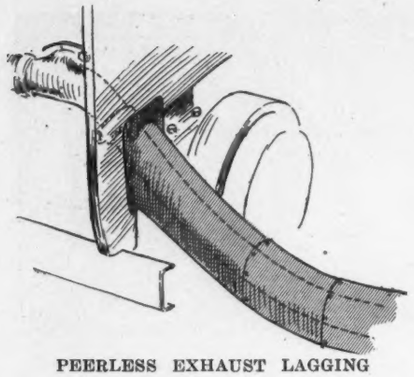


PACKARD 30 IMPERIAL LIMOUSINE



PEERLESS SEVEN-PASSENGER LIMOUSINE





PEERLESS EXHAUST LAGGING

four-cylinder car. The most important is that the crankcase construction is the same as in the six, namely, incorporating the flywheel and clutch. On all three models three lengths of wheelbases are employed. Those used on the 30 chassis will explain this: 114 inches coupe; 123.5 inches touring car, limousine, landaulet, etc.; 129.5 inches brougham. The tubular front axle, a characteristic of Packard construction for years, is continued; semi-elliptic rear springs are retained and no change has been made in the three-speed gearset.

PREMIER

In refining its product for 1912 the Premier company has worked along the lines of quietness and the efforts of its designers has been bent toward eliminating noise. The two chassis, the four and the six, each with 4½ by 5¼-inch cylinders, are retained and in addition the company is turning out a truck which uses the four-cylinder engine found on the pleasure cars. In the quest for quietness a most important change has been made in the valve action. Each pushrod is in a die casting of white metal and guides are individual instead of in pairs. The pushrod has a hardened steel roller, a construction which gives large wearing service, whereas last year there was a cast iron housing which was held down by screws. Now the fastening is by means of a crab on a bolt which holds the push rods down in pairs. The valve springs instead of going through the valve stem now have cupped washers to hold them. Another aid to quietness is an anti-rattler on the emergency brake band which also holds the band off the drum and prevents dragging.

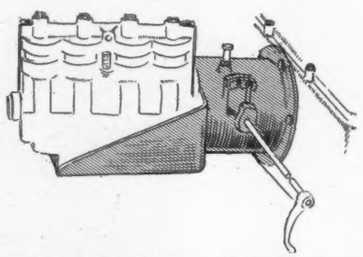
Quietness in the clutch is secured by a change in construction in the release bearing. Formerly there was a common ball bearing cup and cone, while now there are two Hess-Bright bearings which act as rollers, running on a hardened steel disk. The clutch yoke has an adjustment by which the pedal on the release bearing may be adjusted, which prevents clattering of the pedal. The two pedals may be adjusted and are fitted with springs so as to conform to the position assumed by the driver.

The service brakes are lined with Raybestos instead of cork inserts and there are pull rods which are carried inside the frame and led to equalizing beams which are attached to the rear of the sub-frame, the equalizing beams having cork inserts to prevent noise.

There also is a change in the steering gear, the end thrust now being taken up by two Timken bearings, the adjustment nut for the bearings having been elaborated for turning or locking. The method of fastening the rear wheel to the axle shaft also has been changed. Formerly there was a plain nut clamping the wheel to the shaft; now there is a countersunk hole into which a tapered piece fits, the nut binding the tapered piece to the shaft and locking the wheel. The rods from the cutout valve to the operating pedal now have ball-and-socket swivels instead of being hooked. A change in the lubricating scheme has been the elimination of the spoon for a curved tube which shoots the oil direct to the lower end connecting rod bearing instead of splashing. The oil lead to the gearcase has been changed from the right to the left side.

POPE-HARTFORD

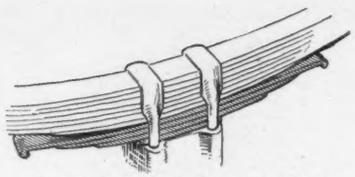
There have been few radical changes in design of the Pope-Hartford cars for 1912, but there have been many minor improvements and refinements in the two chassis models comprising the line, as well as a general change in many of the body details. The four-cylinder model 27, which



PEERLESS METHOD OF CARRYING TIRE PUMP ON GEARBOX

is a continuation of last year's model W, and the six-cylinder model 28, which was known last year as model Y, are practically the same except that the latter has more cylinders and is somewhat larger all through than the four-cylinder model. Such changes as have occurred in the motor and chassis in general are common to both the four and the six. These include the use of quick-action cams which replace the conventional cam design on earlier models and comprise the only change in engine construction. A clutch brake has been installed, a floating rear axle instead of a semi-floating design is employed and the rear springs are three-quarter-elliptic instead of semi-elliptic as formerly.

In the line of body designs seventeen different body styles are offered, a choice much larger in its scope than any former season's offerings. The four-cylinder car is available in nine different bodies, eight of which are prototypes for the corresponding six-cylinder cars. The enlargement of



PACKARD AUXILIARY SPRING

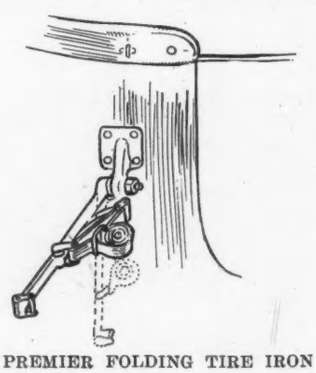
the six-cylinder series for 1912 includes a phaeton, a fore-door roadster and a berline limousine. Except on the roadsters, the tool box, which is of new design, is attached to the rear part of the body within easy reach. As seen from the rear this tool box forms, in effect, a part of the body. The mudguards and running boards have been widened to afford better protection to the car body. The inner sides of the detachable doors and the inside casing of the front compartment have decorative panels, taking the place of the upholstery used in former models.

Another detail of finish in which a notable change has been made is the nickel plating of all exposed metal parts and trimmings. The hood, radiator, guards and brake drum are black enamel. The most of the bodies have detachable fore-doors and a ventilator has been installed in the front of the dash.

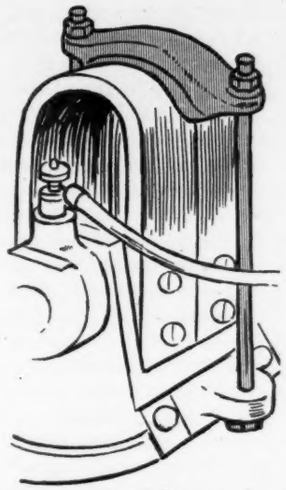
PALMER-SINGER

One new chassis has been added to the Palmer-Singer line for 1912, another six which has been designated the six-40 Brighton. The other two models have been retained with but few changes. The old six-40 has been made into a six-50 by increasing the power of the engine, the jump being from 4 by 4¾ to 4 by 5. A mechanical change has been the substitution of a ball-and-socket joint on the torsion tube for the old yoke. This also has been put on the other model, the six-60. On the latter spiral gears in the engine have replaced the former straight-cut gears and in the body lines there have been a few changes, principal of which is a fore-door body.

The new Brighton model has a 4 by 5-inch motor, the cylinders being cast in blocks of three with valves 1⅞ and $\frac{5}{16}$-inch lift. The cylinders are of the T head type. Lubrication is by splash, the supply being shown by means of a visible oil indicator which is integral with the motor. Plain bearings are used for



PREMIER FOLDING TIRE IRON



PREMIER MAGNETO FASTENING

the pump and magneto drive-gear shafts and there are helical timing gears. The crankshaft is one-piece, there is a large centrifugal water pump and a belt-driven fan. The S. A. E. horsepower rating is 38.4. There is a multiple-disk clutch and the gearset incorporates three speeds ahead, and is integral with the rear axle. There are two independent sets of brakes of the internal expanding type, both located on the rear axle. The brakes are lined with Raybestos. The spark and gasoline control parts are fitted with universal joints throughout. A gasoline pressure system is fitted, all pipe connections being solderless and the tank having a capacity of 23 gallons.

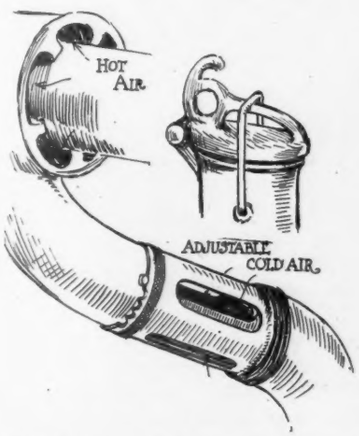
PULLMAN

The Pullman line has been almost reconstructed for this season, one old model having been discarded, an old one retained and three new ones added. Model K, of 35 horse-power, is the one to be dropped; model O, a four-30, has been retained and the four-50, four-40 and six-60 have been added. On model K they have discarded the old engine which had the cylinders cast separately and which were bolted together. Now they are using an engine of the T head type with the cylinders cast in pairs. The addition of a six-cylinder is the most startling innovation, the motor being identical with the four except that it has two more cylinders, the size of which is 4½ by 5½. The six is a seven-passenger and has a wheelbase of 138 inches. A self-starter, an Ever Ready, is fitted to all models and all models have four-point suspension. On the four-40 and the six-60 there is a four-speed gearset and the engine valves are inclosed. There is a dash control of the lubricating system by which the oil level may be controlled without the driver having to leave the seat. Bosch ignition and Stromberg carbureters are fitted. The four-50 has the same motor used last year, one with separately cast cylinders and with a bore of 5¼ inches and a 6-inch stroke. The wheelbase on this is 127 inches. The model O holdover has few changes. The wheelbase has been increased from 112 to 116 inches and like the others is fitted with the self-starter and an electric lighting system. The Pullman this year comes fully equipped.

REO

Reo the Fifth is the designation of the five-passenger touring car model which will be the feature of the Reo line for 1912. While in a general way this model retains many of the features of the 1911, it has been thoroughly gone over and improved and strengthened wherever experience has shown it to be necessary. The body is of the fore-door straight-line type and from the top of the body to the ground the distance is practically 3 inches less than that of last year's car. The wheelbase is 112 inches, which is 4 inches longer than that of the 1911 model.

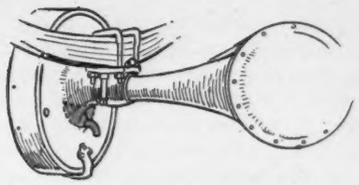
One of the most conspicuous features of this new model is the center control. The steering wheel is on the left side, but the gear-shifting lever is in the center and so designed that the top of the handle moves only 3 inches in going from one speed to another. The emergency brake lever is done away with and the brake operated by the clutch pedal. Both brakes, therefore, are operated by the



PACKARD HOT AND COLD AIR INTAKE AND PACKARD SIX RADIATOR CAP

feet and can be applied whenever necessary without taking the hand from the steering wheel. The center control device is entirely contained in the transmission cover. Both pedals are fitted with ratchets which permit of their being locked independently or both at once when it is desired to coast without holding the feet on the pedals.

The flywheel of the motor has been set back 2 inches to reduce the vibration of the motor. Valve mechanisms have been rendered quite noiseless. Wearing surfaces have been improved and a device for eliminating the noise of the camshaft timing gear has been added. The general appearance of the motor has been greatly improved by a better finish and the nickel-plating of all water pipes, valve levers, operating rods, valve caps and small con-



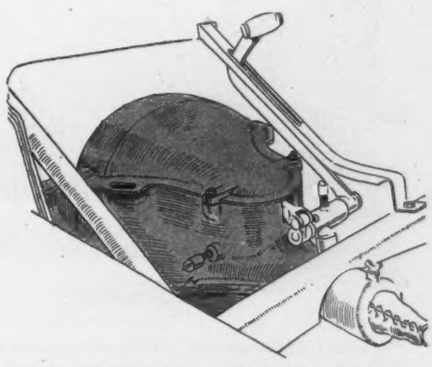
OLDSMOBILE METHOD OF PROTECTING BRAKES FROM GREASE

necting parts. A new one-piece fan is used in place of the old four-bladed fan of last year. An improved adjusting device has been added and also a means whereby the fan may be readily removed. The radiator is considerably increased in capacity. The clutch will be found to be much smoother in action, stopping very quickly and absolutely under the control of the driver.

In the transmission gearset, the main shaft is mounted on Timken bearings and the countershaft on Hyatt bearings. The driving gear bushing has been changed to increase its efficiency. The universal joint between the gearset and clutch has been very much improved. As for the rear axle it has been entirely redesigned, the shafts being of nickel steel and of larger diameter than those of last year; the differential gear having four pinions instead of three whose teeth are much heavier than those of the old type; Timken bearings are used throughout except the outside ones next to the wheels, where roller bearings are employed; the driving pinion is made integral with the shaft; and a great deal of attention has been given to securing quiet gears for this axle.

Brakes have been entirely redesigned, considerably improved and the brake rods placed inside the frame to add to the general appearance of the car. Cables are used instead of rods to do away with all rattle from this source. An important change in the transmission mechanism is the elimination of the torsion tube that inclosed the propeller shaft and the adoption of an exposed propeller shaft with two universal joints.

Several improvements have been made in the frame: Springs have been rendered easier riding; the step board supporting irons have been placed underneath the mudguards, where they are out of



PACKARD CLUTCH AND FLYWHEEL HOUSING

sight; the tool box has been removed from the running board and provision made for the tools under the front seat; an improved muffler and muffler cutout are fitted; the accelerator pedal is of an improved type which allows the foot to rest on the floor at all times, and many other little details of this nature have been given thorough attention.

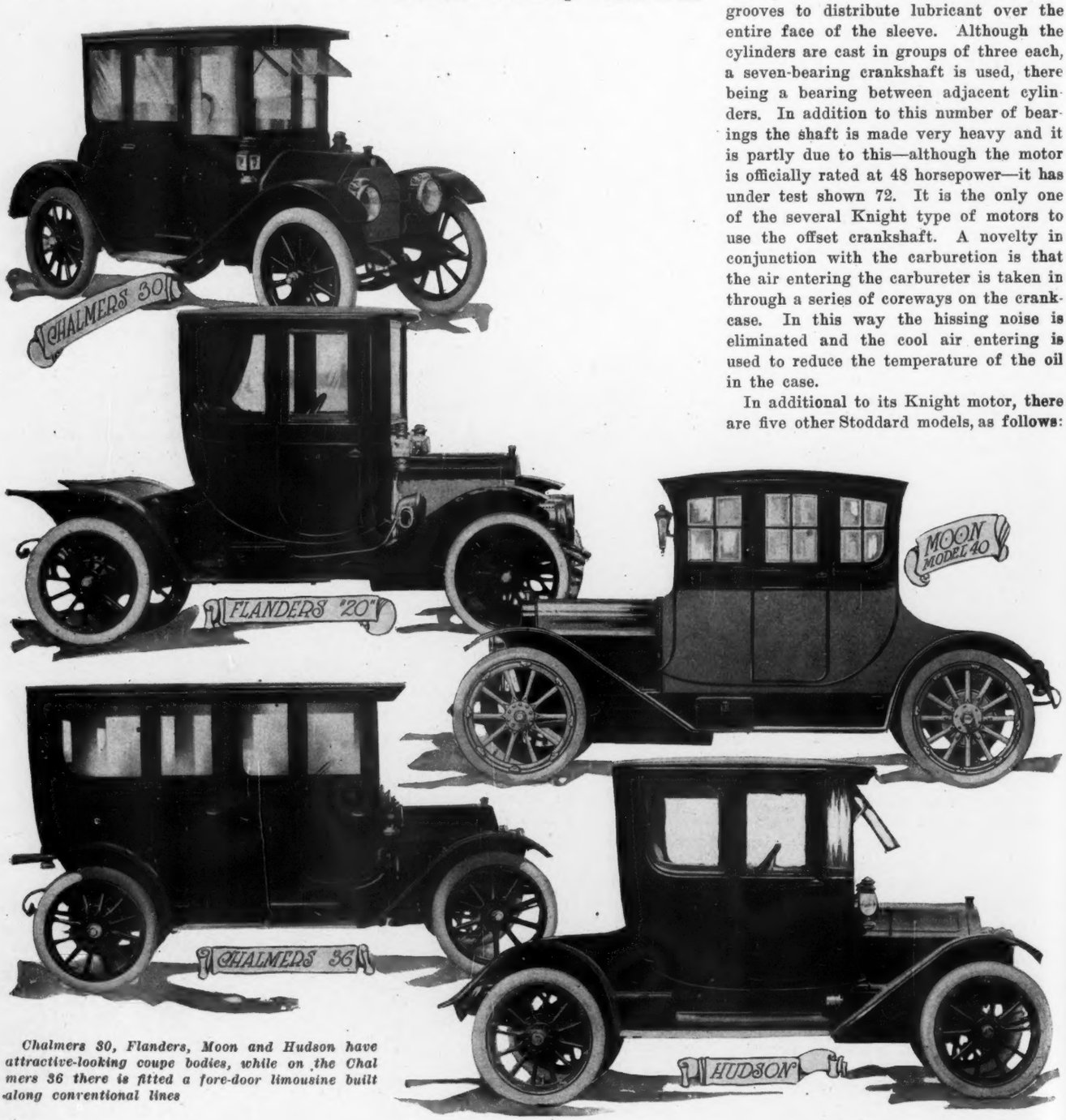
STODDARD-DAYTON

There have been many changes in the Stoddard-Dayton line for this year. Most important of these is the adoption of the Knight type of sleeve-valve motor in the six-cylinder model, known as the Knight-Stoddard-Dayton. This is important not only in that it shows the adoption of the Knight motor, but also that it marks a return to six-cylinder construction by this company. The first Stoddard-Dayton six was brought out several years ago but was discontinued until up to the present.

The new Stoddard-Knight six is an interesting model. It uses the two sleeves which take the place of valves and which are the same as used in all of the Knight types of motors. These sleeves are located between the cylinders and pistons and are reciprocated by short connecting rods on an eccentric shaft, which shaft is driven by silent chain from the crankshaft. A feature of this new motor is that the cylinders are cast in two groups of three each. They have a bore of 4.5 and a stroke of 5.5 inches, which gives this motor the unique position of being one of the longest stroke Knight motors on the market in this country or abroad. It has a rating of 48.6 horsepower.

The movement of the sleeves in this motor, the same as in all others, is interesting. Although the piston has a stroke of 5.5 inches, the sleeves have a stroke of but 1⅛ inches. On the compression stroke both inner and outer sleeves move upwards with the piston, the inner sleeve moving the faster. On the explosion stroke both sleeves move downward with the piston at the point where the side thrust of the piston is greater, thereby eliminating, to a degree, such thrust. The oiling system employed is that of troughs beneath the connecting rods into which these dip. Both sleeves are gray iron casting finished inside and outside on special grinding machines, and on the outer surfaces are oil grooves to distribute lubricant over the entire face of the sleeve. Although the cylinders are cast in groups of three each, a seven-bearing crankshaft is used, there being a bearing between adjacent cylinders. In addition to this number of bearings the shaft is made very heavy and it is partly due to this—although the motor is officially rated at 48 horsepower—it has under test shown 72. It is the only one of the several Knight type of motors to use the offset crankshaft. A novelty in conjunction with the carburetion is that the air entering the carbureter is taken in through a series of coreways on the crankcase. In this way the hissing noise is eliminated and the cool air entering is used to reduce the temperature of the oil in the case.

In additional to its Knight motor, there are five other Stoddard models, as follows:



Chalmers 30, Flanders, Moon and Hudson have attractive-looking coupe bodies, while on the Chalmers 36 there is fitted a fore-door limousine built along conventional lines

Special, 40 horsepower, with valve-in-the-head motor, 5 by 5.5 bore and stroke; Saybrook, 36.1 horsepower, valve-in-the-head motor, 4.75 by 5-inch bore and stroke; Stratford, 27.3 horsepower motor, L-type, 4¼ by 5¼ bore and stroke; Savoy, 25.6 horsepower, L type motor 4 by 5.5 bore and stroke; and Courier, 22.5 horsepower, 3.75 bore and 5⅛-inch stroke. The same chassis is employed on the Knight Special and Saybrook models, which is characterized with left-hand steering control and the emergency and change-speed brake levers mounted in the center of the body. The valve-in-the-head motor used in the Special and Saybrook models is of the same design as employed last year.

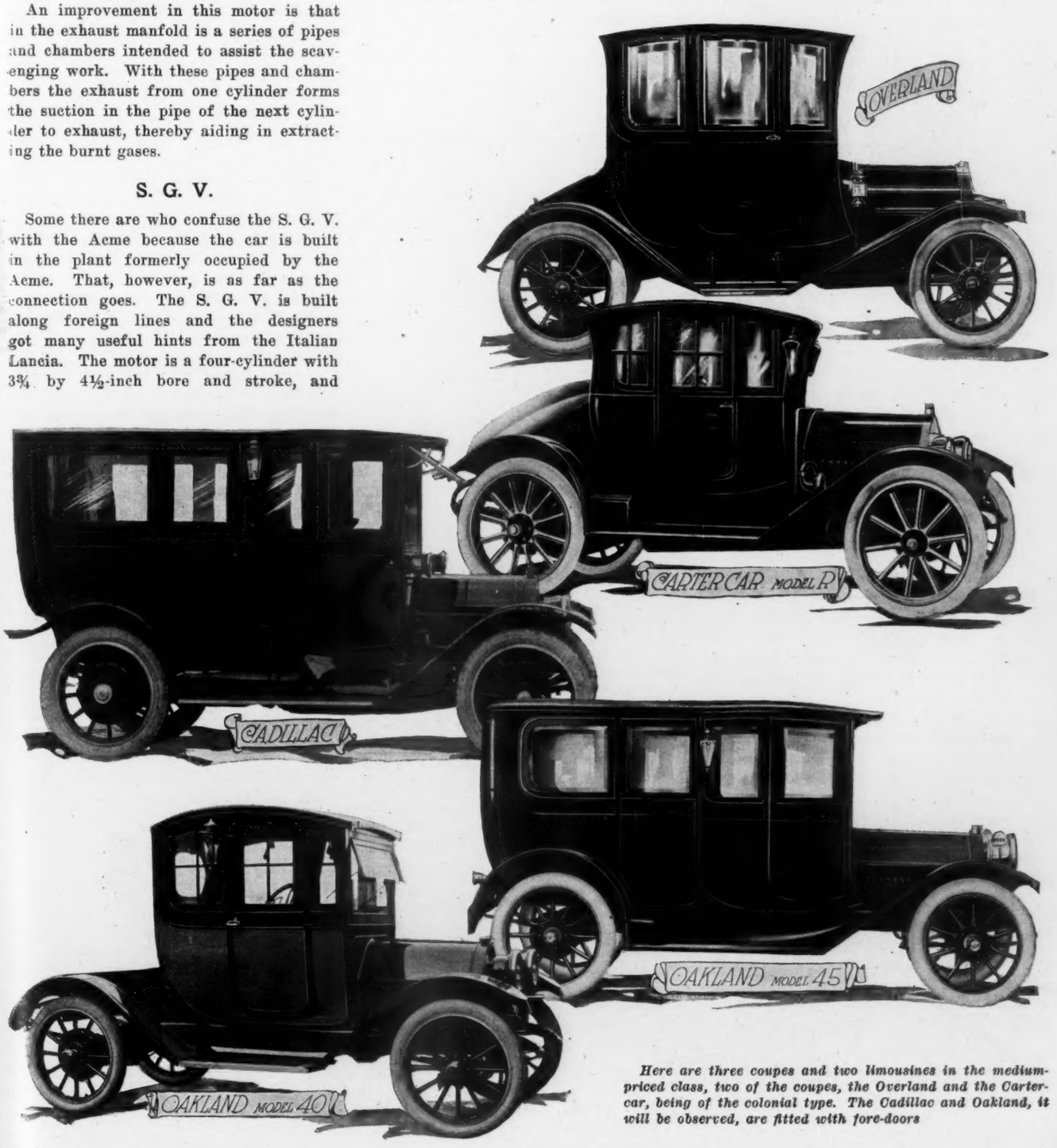
An improvement in this motor is that in the exhaust manfold is a series of pipes and chambers intended to assist the scavenging work. With these pipes and chambers the exhaust from one cylinder forms the suction in the pipe of the next cylinder to exhaust, thereby aiding in extracting the burnt gases.

S. G. V.

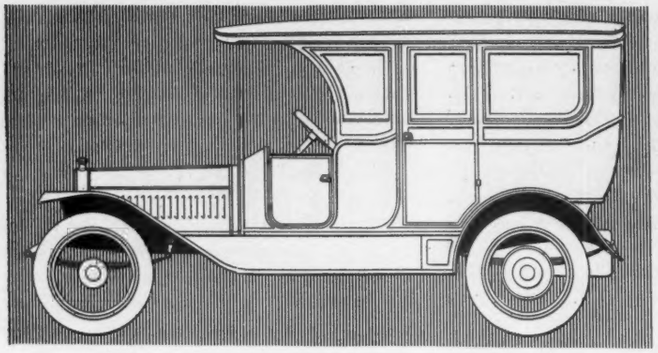
Some there are who confuse the S. G. V. with the Acme because the car is built in the plant formerly occupied by the Acme. That, however, is as far as the connection goes. The S. G. V. is built along foreign lines and the designers got many useful hints from the Italian Lancia. The motor is a four-cylinder with 3¾ by 4½-inch bore and stroke, and there is only one chassis. A change for 1912 is the inclosing of the valve springs. The dash is remarkable for its cleanliness, the pressure gauge being the only device located on it. There is a fixed spark and the magneto switch is located in the center of the steering wheel. The carbureter also has been made fool-proof, the designer following the foreign practice of setting it before the car leaves the factory, so there is no chance to adjust it after. The mainshaft of the gearset is carried on a double race of ball bearings in the rear end of the gearbox, to give a stout support. The shaft carries the foot brake immediately behind the gearbox, this brake being operated by worm and screw. The oiling system pumps oil direct to the bearings through the hollowing out of the crankshaft. The wheelbase is 116 inches and the wheels 34 inches, with large spokes. The tires are 4 inches in section.

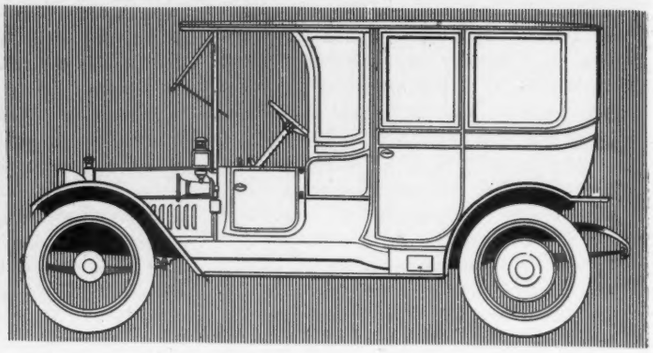
SELDEN

Following last year's practice, the Selden sticks to one chassis and offers a choice of five models, ranging from a two-passenger roadster up to a seven-passenger limousine. No startling mechanical change is announced, the chief difference being the adoption of a dry-plate multiple-disk clutch in place of the cone type used last

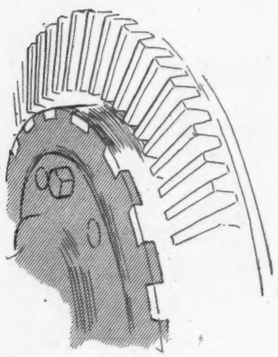


Here are three coupes and two limousines in the medium-priced class, two of the coupes, the Overland and the Carter-car, being of the colonial type. The Cadillac and Oakland, it will be observed, are fitted with fore-doors





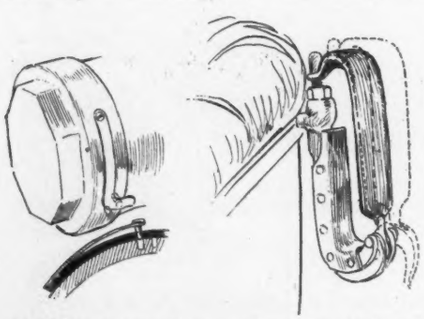
TWO OF THE LIMOUSINES FOR 1912 —WINTON AND STEARNS-KNIGHT



STEVENS-DURYEA DOVETAILED DRIVING GEAR FASTENING

year. This clutch is inclosed in a housing bolted to the flywheel. There are thirteen disks, the driving disks being faced with an asbestos composition riveted on, while the driven disks are left plain. The inner or driven housing incloses a pair of heavy spiral springs, while three studs extending through the pressure plate provide a convenient means of adjusting the tension without removing any housing or cover. An automatic spring lock secures the studs from turning.

Another change is the adoption of a full floating rear axle of new design on which the drive pinion shaft runs on New Departure ball bearings. The differential housing is on Hyatt high-duty bearings with ball thrust and the wheels are mounted on New Departures. A cover on the housing permits the entire differential mechanism to be removed or adjusted. The axle shafts carry driving flanges through which the hub bolts pass. This reduces the motion and relieves the hub caps from the necessity of holding the axle shafts in



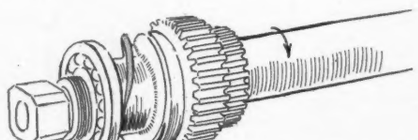
PEERLESS HUB CAP FASTENING AND TOP BAR CLAMP

place. To avoid leakage of oil into the brake drums, sleeves are carried on the hubs which lead any oil which may work out along the axle shaft into an annular recess in the brake flange, from which it is drained out on the road. Both brakes are of the internal expanding type, the bands being 1¾ inches wide and 14 inches in diameter.

The Selden motor is a four-cylinder, 4¾ by 5 as last year, and the valves are placed on the left side as before. The cylinders are cast in pairs and the valves are interchangeable, the diameter being 2¼ inches and the lift 5-16 inch. A web is carried out from the cylinder castings surrounding the valve mechanism and a removable aluminum cover serves to completely house in these parts, excluding dirt and reducing noise. The crankcase is cast in two parts.

SIMPLEX

The feature of the 1911 Simplex line was the addition of a long-stroke shaft-driven car by a factory which had formerly pinned its faith to the double chain as a means of



PEERLESS DEVICE, A WORM THAT PREVENTS GREASE ESCAPING FROM GEAR BOX

final drive. The 38-horsepower chassis with its shaft-drive is offered with very few changes from the design embodied in last year's product. The most important change lies in the design of the carbureter. The single-jet type which was employed heretofore in both the chain and shaft-driven models is replaced by a multiple-jet type, although the former is still employed on the chain-driven models. A more noticeable alteration is the lengthening of the wheelbase for the seven-passenger body from 127 inches to 137 inches, although in the four and five-passenger touring bodies and some of the inclosed types the shorter wheelbase is retained.

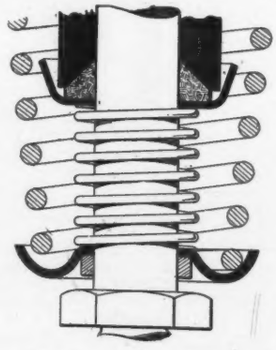
Aside from the carbureter, the power plant remains unchanged. It is of the two-unit type in which the clutch is a unit with the flywheel with the gearset separate. The four T-head cylinders are cast in pairs and have a bore of 4⅞ inches with a stroke of 6½ inches, or one and a third times the bore. There has been no change in the chain-driven models except that an acetylene self-starter has been installed which necessitates the use of Bosch dual ignition in place of the Bosch single ignition system employed before.

The chain-driven cars are known as the model 50 and have four cylinders, 5¾ inches bore and stroke, cast in pairs. Three different wheelbases are employed, the seven-passenger touring car having 139 inches, the inclosed bodies having 129 inches, while the four and five-passenger touring cars and the runabout are fitted on a 124-inch chassis.

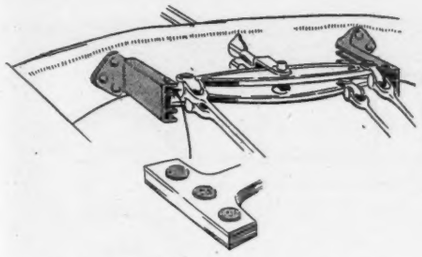
SPEEDWELL

Very few changes in design have been made in the 1912 Speedwell motor car. This, notwithstanding the fact that it always has been Speedwell policy to make any necessary changes or refinements as soon as their need was assured and not to wait for a new season to install such features. As far as mechanical changes in the construction of the mechanism are concerned, they are limited, practically speaking, to a slight increase in the diameters in the valve stems and valve-stem guides, and to the introduction of larger shafts and non-adjustable ball bearings in the gearset to replace the roller bearings previously employed.

One of the effective models of the 1912 line is the semi-racer which is equipped with a small tonneau. This machine has the straight line style of body with hooded dash and fore-doors, but its low-seating



OVERLAND VALVE STEM PACKING



PREMIER BRAKE EQUALIZER GUIDES WITH CORK INSERTS

arrangement, large mud guards and general rakishness have just the suggestion of stability under high-speed running conditions that is desired by many motorists. While electric lighting is not standard equipment on the Speedwell cars, the company was one of the first to establish the regular mounting and driving arrangement to render the installation of a lighting dynamo a relatively simple matter. Demountable rims of Firestone make, tonneau fittings, tools, lamps, gas tank and horn are items of stock equipment; while on the Cruiser model the top and windshield, as well as rear shock absorber, are added. All cars are sold fully equipped for 1912 for the same price as in 1911 without the equipment.

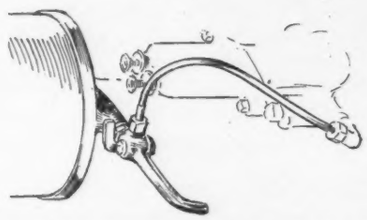
STEVENS-DURYEA

There are three Stevens-Duryea models, this pioneer concern in the six cylinder field producing two six-cylinder types and one four-cylinder. All are essentially Stevens-Duryea products and designed along the same general line, namely, with a unit construction of motor, clutch and gearset, all carried on three-point suspension. Model X, a six-cylinder type, is continued the same as last year without change. Model Y, a four-cylinder design, is continued in its 1911 form. In model AA, however, the changes which take the form of refinements are found. Most important is the substitution of a Bosch two-independent ignition system for the double system in use last year. In the two-independent system the magneto constitutes one source of current and the batteries another.

There is mounted at the left front of the motor a timer-distributer for use in the battery system. This timer-distributer is but a combination of the make-and-break mechanism of the Bosch magneto, and also the distributer part, the former in the primary circuit and the latter in the secondary circuit. A still further change in this model is the employment of a four-cylinder gear-driven air pump for inflating the tires. This pump is mounted on the left front of the motor and is gear driven. A gasoline gauge is now added for the convenience of the operator and to the car equipment has been added top, speedometer and windshield.

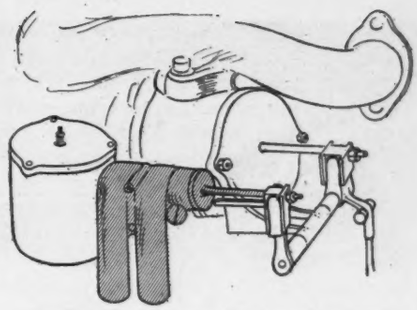
STEARNS

All of the Stearns models for this year are fitted with a Knight type of sleeve valve motor, this company having discontinued entirely the manufacture of its previous poppet-valve types, which action was taken after having spent a long time in complete investigation of the Knight motor as manufactured by the Daimler Co. in England. Only one size of motor has been marketed to date, it being 4.25-inch bore and 5.5-inch stroke giving horse-



EMERGENCY FAUCET ON PACKARD OIL TANK

power rating of 38.9. It is a four-cylinder type of engine with cylinders cast in pairs. As in all Knight types of motors the poppet valves have been replaced by two reciprocating sleeves which operate inside of the cylinder, and the piston in turn being within the inner sleeve. These sleeves are reciprocated by short connecting rods from an eccentric shaft carried within the crankcase. Each sleeve has a port or opening on the right side and also on the left and in the cylinder castings are ports with which these register. The ports on the right side are for the intake gases, those on the left for the exhaust. The intake port is ½ inch deep and extends 124 degrees around the sleeve; the exhaust port is ⅝ inch high and extends



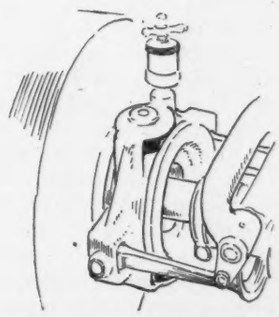
SIMPLEX IMPROVED CARBURETER

124 degrees. The size of the intake port is practically equal to a rectangle 4.5 inches long and .5 inch wide. These sleeves are reciprocated at a slow speed approximately 90 feet per minute travel.

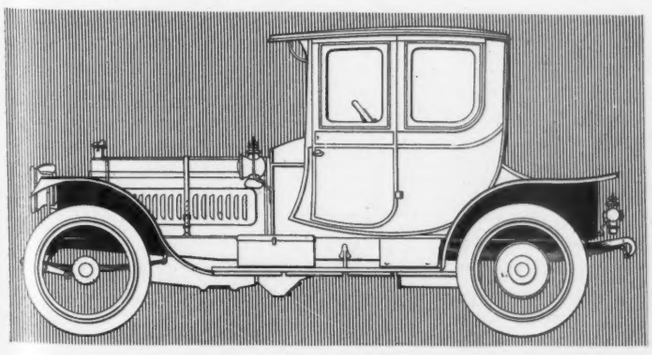
The stroke of each sleeve is 1⅛ inches which gives a piston speed of 93.7 feet per minute and the motor is working at 1,000 revolutions per minute, and when the piston speed is 916 feet per minute. Owing to this sleeve design it is possible to obtain a spherical combustion without offsets at the right or left side.

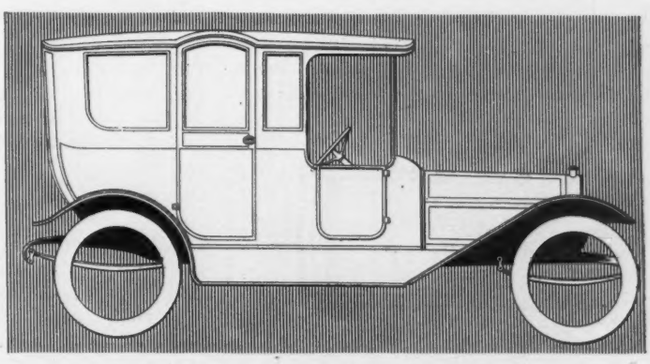
The lubrication in this motor is the trough system, there being a trough beneath each connecting rod and into this dips a small finger or scoop on the lower end of the connecting rod cap. The oil pump feeds into the trough, giving a fresh supply of oil. The troughs are hinged at one end and can be raised or lowered to feed more or less oil. They also are interconnected with the throttle so that when the throttle is opened more oil is fed.

The general chassis features of this Stearns car are the same as last year. The side members of the frame have a double

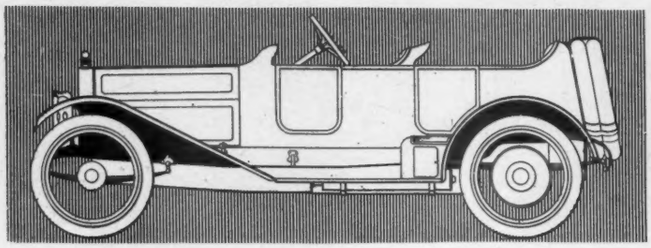


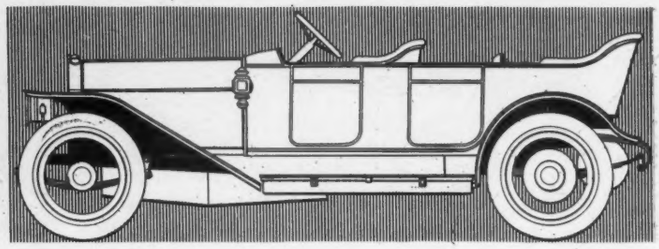
PREMIER BALL BEARING CLUTCH RING





PACKARD SIX WITH COUPE BODY AND PIERCE-ARROW LIMOUSINE





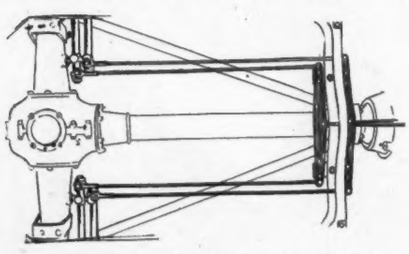
TWO OF THE FORE-DOOR BIG CARS—THOMAS AND STODDARD

drop; three-quarter rear elliptic springs are used and the propellorshaft is inclosed in a torque tube. The rear axle is a combination design made of a forging forming a stationary part and into which the differential housing is attached. Two lengths of wheelbase are used, one 120 inches with touring car, limousine and landaulet, and the other 116 inches for toy tonneau and roadster.

THOMAS

There is but one Thomas model, and that a six-cylinder type, which is a continuation of the 1911 one with many improvements. A complete new system of circulating lubrication for the motor has been added, which has called for a redesigning of the base of the crankcase in order to make room for an oil reservoir containing 3.75 gallons. In this reservoir is incorporated a sliding vane pump which delivers lubricant to a ½-inch copper pipe to the timing gear housing, to the front half of the crankcase and to the rear half of the case. Within the motor a typical splash system of oiling is used the lower ends of the connecting rods dipping into the oil and splashing it to fill the pockets over the crankshaft bearings as well as splashing it into the cylinders. In addition to the crankcase oil supply a novelty has been introduced by carrying a 6-gallon oil tank under the chassis at the left rear. This is a long cylindrical-shaped tank pointed at both ends.

On the right side of the chassis is the gasoline tank similarly mounted and with 24 gallons capacity. Locating these tanks in this position has lowered the center of gravity of the car and left the space beneath the front seat for baggage-carrying facilities. There also is space under the rear seat. Space beneath the front seat is divided, one portion for baggage and the other for carrying the storm curtains of the top. Two independent ignition systems are used, one a Bosch high-tension outfit, and the other a battery. A radical change in the motor is the reduction of the cylinder compression to 62.5 pounds.

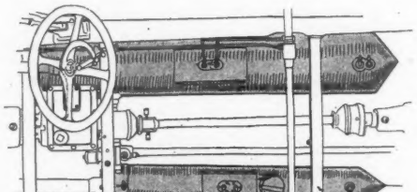


SIMPLEX BRAKE EQUALIZERS

These has been redesigning of the intake manifold. It is now a three-arm Y. The center arm is a short one located in the angle between the two outer arms and connects with the middle pair of cylinders. In this manifold there is no opportunity of condensing of gasoline. A Miller carbureter is employed, a characteristic of which is that when the throttle is opened the needle valve is raised, feeding more gasoline; but when this is done the annular air space around the nozzle is also increased, this being accomplished by a vertical sliding sleeve. This sleeve flares outward at its lower end and thereby forming an adjustable venturi.

WINTON

There is but one Winton model for this year. It is a six-cylinder type, 48.6 horsepower, 4.5-inch bore and 5-inch stroke, these measurements not having been altered since June, 1907, when first brought out by this company. This motor is mounted in the chassis with a wheelbase 120 inches, which is 6 inches longer than employed last year, the extra space being absorbed in foot room for the front-seat passengers and also additional room in the tonneau. The fore-door body is standard, as compared with being an optional feature last year. All bodies, whether touring, roadster, or limousine, are mounted on this one chassis, a feature which must greatly facilitate manufacture. In analyzing the motor few changes are found. One minor one is fitting a new coupling between the water pump and the magneto. It is a jaw-type coupling improved by the addition of a take-up device for taking care of any looseness that might develop.



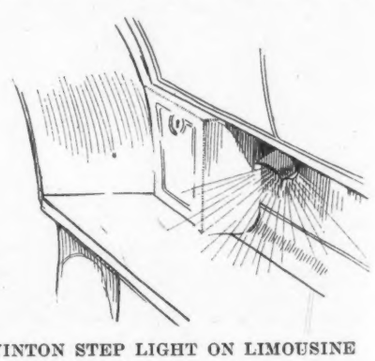
THOMAS GASOLINE AND OIL TANKS

Ignition, carburetion, lubrication and cooling remain the same. The compressed air self-starter is continued. It would be wrong to discuss the motor without mentioning that the vertically-divided crankcase is continued. This allows of removing one side of the case without disturbin the crankshaft bearings, the value of which is that every access is given for adjusting the lower connecting rod bearings. Another characteristic continued is the offset crankshaft which offset is approximately 15 per cent of the stroke.

Back of the motor few changes are noted. One is the use of adjustable brake and clutch pedals in which the foot piece is carried on a stub rod with serrations, which telescopes with the tubular pedal shaft, a pinching bolt holding any setting desired. Another improvement is the use of a new universal joint in rear of the gearbox. This joint is claimed to be oilproof. In the body lines several changes are noted: One is the equipment of electric dash lamps located within the cowled-dash so that only the glass is visible Headlights and tail lamps are oil-electric combinations. An important body improvement is the more luxurious upholstery and the use of thicker cushions which tilt rearward, thus eliminating the tendency of the passengers to slip forward off the seat. Booth demountable rims are now stock equipment, and 4.5-inch front tires are used instead of 4-inch sizes. Provision is made on the gearbox whereby a Gray & Davis dynamo for electric lighting can be fitted if desired. The transmission and rear axle systems remain unaltered.

WHITE

The White has joined the six-cylinder squadron, but it has not put all its eggs into the one basket but continues the two four-cylinder gasoline models which it had last year. The six is simply an addition to the line. The motor is not of the same power as the four, but has larger cylin-



WINTON STEP LIGHT ON LIMOUSINE

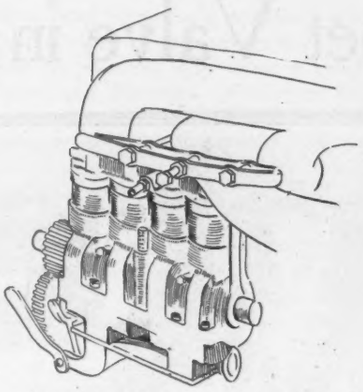
ders—4¼ by 5¾—whereas the four is 3¾ by 5⅛. It is the same type—an L head—and with the cylinders cast monobloc and with both sets of valves on the right side. As on the four the lubrication is secured by means of a combination of the splash system and positive feed. In other points there is similarity. The six uses high-tension single ignition, employing the Mea magneto, uses the White carbureter, a cone clutch, four-speed gearset, shaft drive and semi-floating rear axle. The wheelbase is 132 inches, with the tires 37 by 5. The front springs are semi-elliptical and the rear three-quarter. The front axle is I-beam and the rear semi-floating. The frame is chrome nickel steel, heat-treated.

The White six has a self-starter of the electric type, which is combined with a lighting system. It is automatic and also is used as a generator to charge the batteries after the motor is started.

SYNOPSIS OF TREND

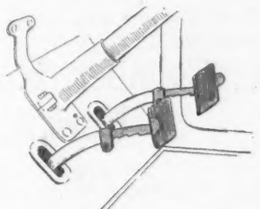
After studying over all of the changes that the different car makers have incorporated into the 1912 models it is natural to reflect on what have been some of the general lines of change—call it progress if you care to. It is unmistakable but there has been quite a gaining in the six-cylinder field, led by such concerns as Packard, White, Stoddard, Everitt and Garford. The use of the monobloc casting in a six is new and the appearance of three six-cylinder models with the cylinders cast in threes also is new. One cannot but note the increase in the number of four-cylinder motors using the monobloc casting, Garford, Inter-State, Stoddard-Dayton and many others having made strides in this respect.

It is impressive to see how much attention has been given to inside control, that is, placing the change-speed and emergency brake levers inside of the body, which now is a flush-sided design. Not a few have thrown custom to the winds and are placing the two control levers in the center of the floor board for left hand operation. This gives much more room for



STEVENS-DURYEA TIRE PUMP

the driver's knees and there is less danger of confusion owing to lack of space. Not a few makers have gone still further and mount the steering column on the left and put the control levers in the middle. The Stoddard six has this and in the White six the column is on the left. There is not a solitary example of a concern that has put the steering column on the left in the past changing it back to the right side. The National is one of the latest makers to use the left hand steering col-



WINTON ADJUSTABLE PEDALS

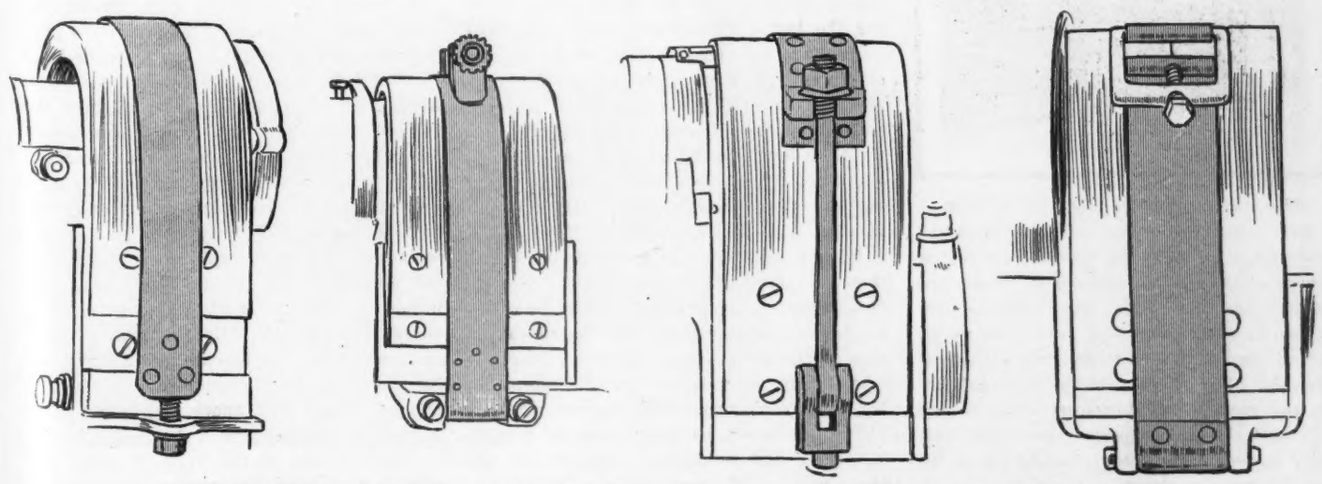
umn with central levers. In not a few cases the desire of doing away with the emergency brake lever has developed so that now one brake is connected up with the clutch pedal and the other is given a separate pedal. This leaves only one control lever. Undoubtedly the lack of space inside the fore-doors has led some of the makers to eliminate the brake lever.

The use of seven bearings for the crankshaft in six-cylinder motors is growing. In the Stoddard-Knight, although the cylinders are cast in two groups of three, yet the crankshaft has seven bearings, one placed between each set of adjacent cylinders. In the Peerless six models the seven-bearing shaft has superseded the four-bearing type of last year. The Locomobile uses a seven-bearing shaft in both its big and little sixes. The Pierce-Arrow sixes have since their inception been exponents of the seven-bearing shaft.

Many of the improvements mentioned in connection with the many cars that have been briefly reviewed in the foregoing pages refer to details within the motor, changes which cannot be noticed in a cursory observation but which are real engineering alterations. In this respect there has been wide attention given to increasing the diameter of the valve tappets and also adding to their length. This has been done to prevent wear, and when you prevent wear you thereby insure quietness. The advent of the non-poppet valve motor has accentuated the silence phase of the car, and it is most natural for all makers of poppet-valve types to do everything in their power to insure quietness as long as possible. Increasing the diameter and length of these parts is a good step in this direction. It is a commendable one. The use of plates to enclose the valve springs also can be included in this line of improvements.

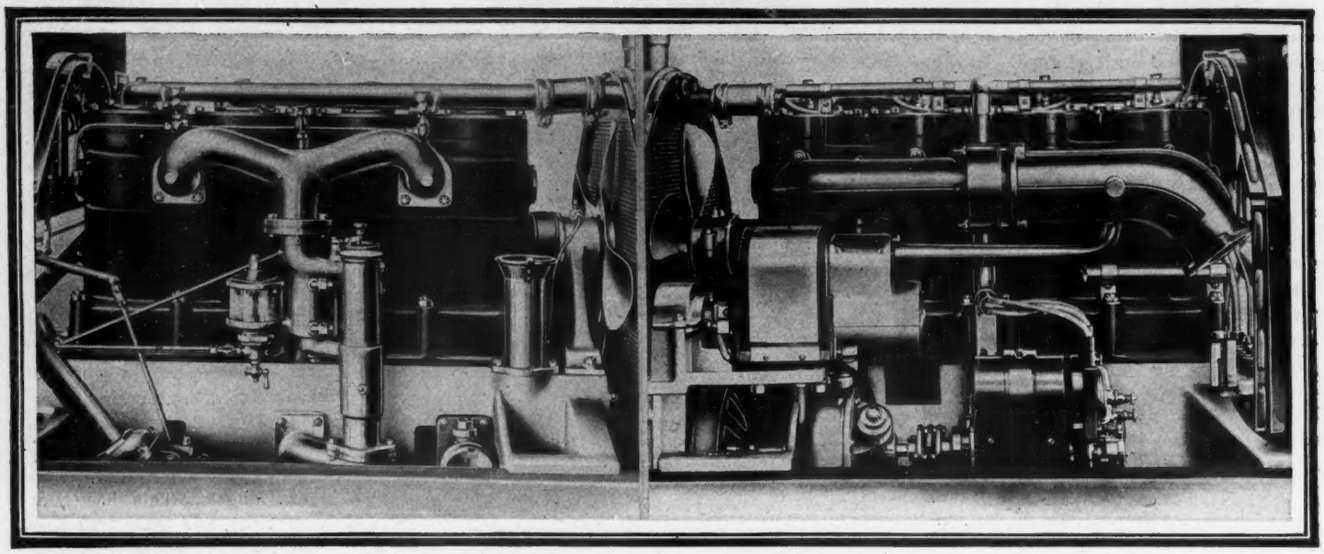
There are very few makers who do not refer in one or more of their models to increases made in tire sizes. With one maker the front tire sizes have been jumped from 4 to 4.5 inches; and with another the rear sizes are now 37 by 5 instead of 36 by 4.5. All of these increases in size mean longer tire life to the car buyer and they should also mean less liability to tire troubles.

Not a few makers have pointed to the improvements in lubrication details of the chassis, some of which have to do with grease cup location.

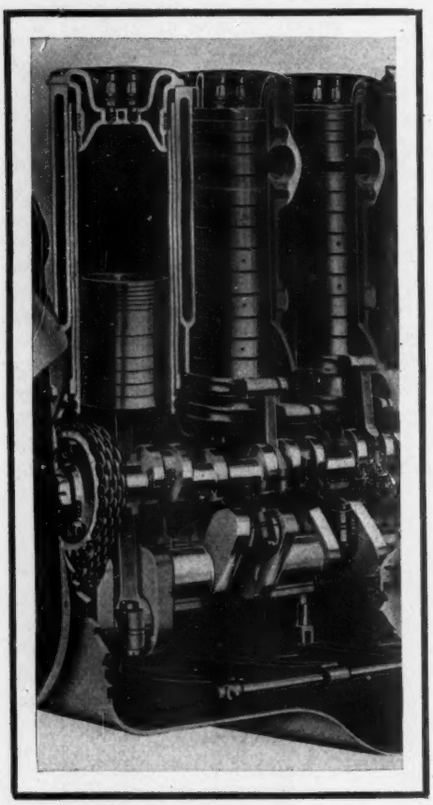


FOUR TYPES OF MAGNETO FASTENINGS—REO, MARQUETTE, PULLMAN AND STEVENS-DURYEA

The Non-Poppet Valve in Varied Phases



STEARNS MOTOR WITH KNIGHT DOUBLE-SLEEVE VALVES



STODDARD-DAYTON SLEEVE MOTOR

This illustration shows the front three cylinder motor, in which the cylinders are cast in groups of three each. Between the piston and cylinder are the two reciprocating sleeves driven by short connecting rods from an eccentric shaft which is driven from the crankshaft by silent chain. In the third cylinder the two ports in the sleeves are shown in register with the cylinder port, which is the open-valve position. The second cylinder shows the valve or opening closed

Five Major Classes of Non-Poppets

Sleeve, Cylinder, Ring, Disk and Piston Types—Europe Much Interested

Double Sleeve and Rotary Cylinder Valve Types Are Gaining—Piston Valve Types Attract Attention

AMERICA has got really interested in the non-poppet valve motor; so great is the interest that five American concerns are making and marketing cars with such motor types and two other concerns have had cars with motors of this type on the road for months. The introduction of the non-poppet motor type has not been a big surprise because American builders have watched the progress of the different non-poppet types in the European laboratories for the last 4 years and many visits have been made to those laboratories and many overtures have been made for privileges of making the different types under royalty and of purchasing some of the patents outright. After a period of quiet watchfulness and study it is not surprising that the introduction of the Knight double-sleeve motor by Columbia, Stearns, Stoddard-Dayton and Atlas has come more as a matter of course than as a thunderbolt from a clear sky, in fact, many car owners throughout the country have been wondering why the manufacture of the Knight type was not previously taken up in this country when it was meeting with such unqualified success abroad. That story would be largely one of patent diplomacy and intrigue, a feature out of place here.

For years we have read and discussed rotary valves, sleeve valves, disk valves, ring valves and many other types of non-poppet valves, but never before have we come face to face with the actual fact. For months companies have been turning out sleeve valves, the public has been buying them, the public has been riding in them, but now the to-be stage has become history. The Stearns company has pinned all its faith to the Knight double-sleeve type, having entirely discarded the manufacture of the poppet-valve motor much as the Daimler company did some years ago in England. The Stoddard-Dayton interests have adopted the Knight type in a new six-cylinder model which has been on the market for 4 months; the company is continuing many of its poppet-valve types; the Columbia company has been delivering Knight types of sleeve-valve motors for 5 months, making it in one model, but also marketing poppet-valve types; and within the last few weeks has come the announcement that the Atlas company of two-cycle reputation has adopted the Knight motor and will market a car with it during the present year. Still another chapter exists in the Knight campaign in America, namely, the manufacture of this type of motor for sale by the Atlas Engine Co., it being al

ready commonly gossiped that several car builders have already contracted for motors of this type for some of their 1913 models. All of this activity means business, it means that the wedge to break up the solid phalanx of poppet-valve makers has not only been entered but driven well in, in a short time.

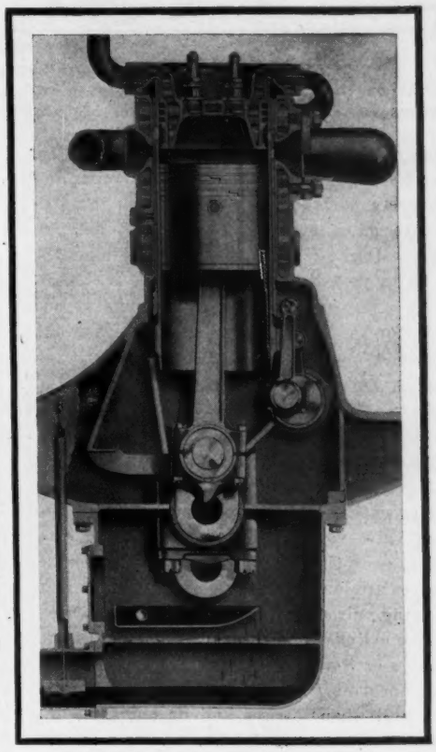
The fact that Mercedes is building a couple of Knight types of chassis; that Panhard over 10 months ago was making over one-half of its output of Knight types; that Minerva in Belgium was turning out over 1,000 Knight types per year; and that other concerns in England, such as Rover, Deasy, etc., are buying motors of this type for their cars has established without doubt the field of the non-poppet valve.

But the Knight has not been the only type marketed, and while the pioneer and immeasurably the leader so far as use is concerned other companies have been doing good developing and missionary work. Darracq is marketing a model this year with the Henriod rotary cylinder valve, and is actually selling cars. The Itala company in Italy has brought out a new rotary cylinder valve, which it is making and marketing in one model; the Crowdy company in England is marketing two models with the Hewitt type of piston valve; the Mead rotary cylinder valve motor was shown to the public last year during the Engineering convention at Dayton, O., and several cars with this motor installed were used for demonstrating purposes; the Reynolds rotary disk valve has been used in marine engine work and is now being developed by the Reynolds Motor Co. for motor car use; the Cid, a French rotary ring type of valve, has been on the Paris market for over a year, and in its present improved form is being offered to the public in a four-cylinder chassis; the CLC, a rotary sleeve valve, is also being marketed in Paris, although in what quantities it does not appear; the Argyll company of Scotland is marketing one model with its single-sleeve valve which has a combination reciprocatory and rotary movement; and the Reno reciprocating ring valve is being exploited and developed in America by the Sphinx company. In addition to these well-known types of valves there are many others under development in different cities in America. Some of these have been in use in cars for over a year and are giving good satisfaction, but for one reason or another the inventors have never felt ready to present them to the public. In some instances, while the designs work satisfactorily yet they are not manufacturing propositions. Types have been used with success, but the weight of the motor was too great; others have given equal success but they were too expensive to manufacture; and with others while they have given a measure of success the mechanics have been at fault.

Five Leading Types

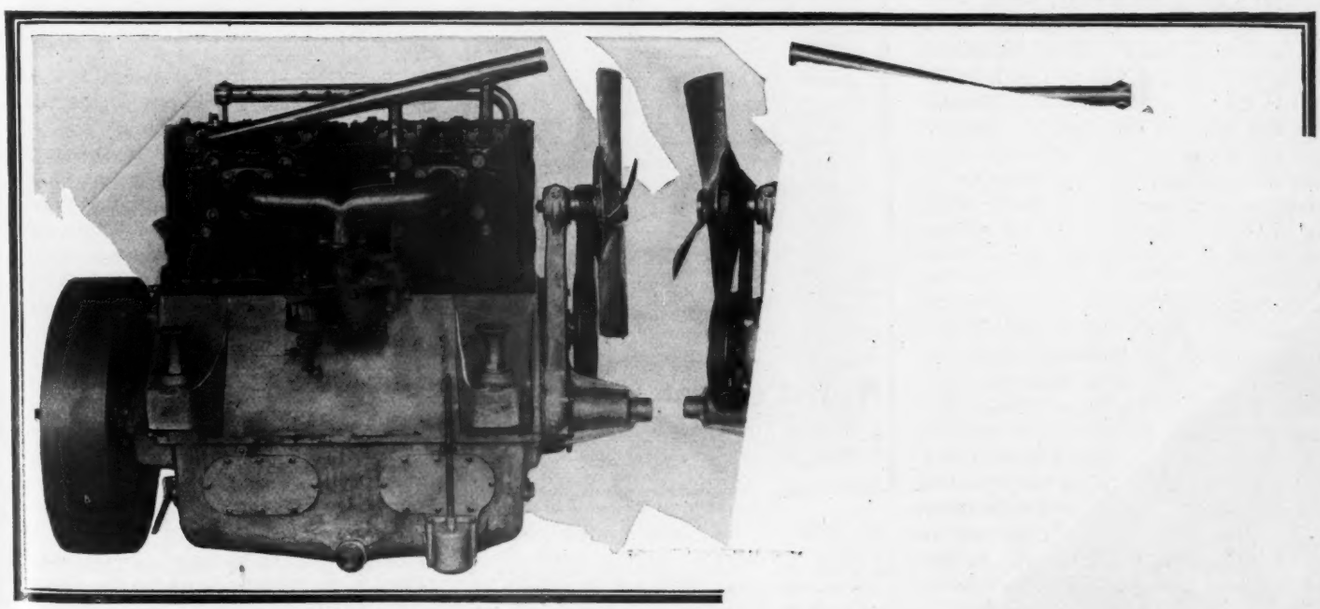
ROUGHLY speaking, there are five major types of non-poppet valves. These are as follows: sleeve types, cylinder types, ring types, piston types and disk types. The biggest and most interesting class is the sleeve type, in which one or more sleeves are placed inside the cylinder and between it and the piston, so that the piston is inside of the sleeve. There are three divisions of this class, namely, the double-sleeve type, of which the Knight is the only exponent; the single-sleeve type, in which the sleeve is rotated instead of reciprocated, the French CLC being the representative of this class; and the combination single-sleeve valve, in which the sleeve is reciprocated and partly rotated, the new Argyll being the only exponent of this class. In the Knight type, a complete description of which follows in a few later paragraphs, there are two reciprocating sleeves which cover and uncover intake and exhaust ports or openings in the opposite sides of the cylinder walls. These sleeves have corresponding ports cut in their upper ends. The sleeves are reciprocated by short connecting rods. In the CLC the sleeve rotates in one direction and has a port which registers with intake and exhaust ports in the cylinder walls. In the Argyll, the sleeve has a short reciprocation and rotates a part of a revolution to the right and then back.

There are three big examples and exponents of the rotary cylinder type, the Mead in America, Darracq in France, and Itala in Italy. The rotary cylinder valve is one in which a long cylinder varying from 1½ to 3 inches in diameter lies in a chamber along one or both sides of the motor in the posi-

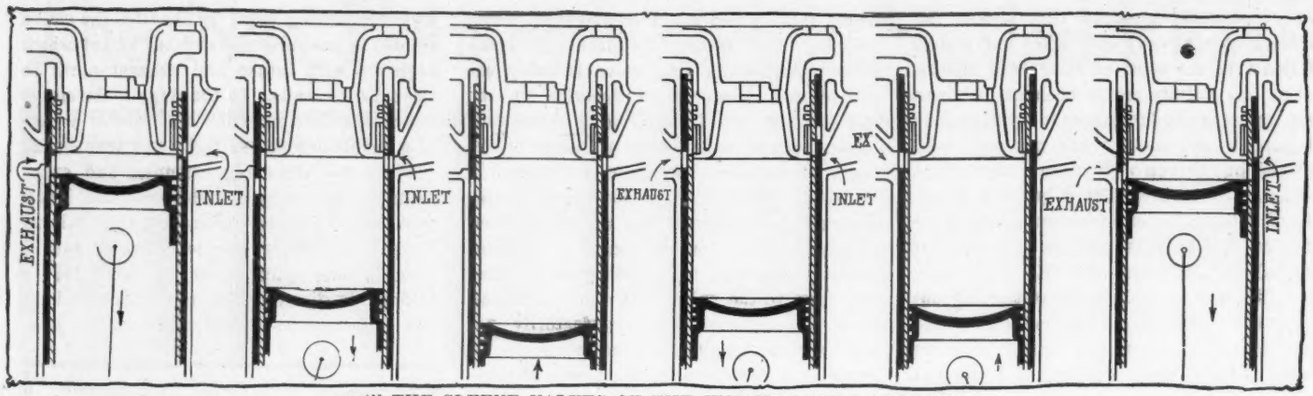


COLUMBIA SLEEVE-VALVE MOTOR

The two sleeves are shown with the intake and exhaust both closed. The oil trough for the connecting rod is shown



TWO VIEWS OF COLUMBI



HOW THE SLEEVE VALVES OF THE KNIGHT MOTOR OPERATE

The six illustrations show the intake and exhaust ports opening and closing. The intake closes by the inner sleeve rising. The exhaust opens by the inner sleeve lowering before the outer one starts moving and then both lower together. When the intake opens the outer sleeve lowers rapidly, the inner one remaining stationary

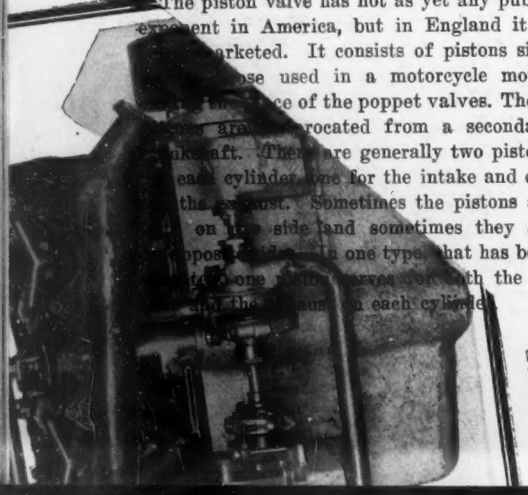
tion of the poppet valves. This cylinder rotates steadily in one direction and covers and uncovers ports in the cylinders through which intake gases enter or the exhaust escapes. In the Darracq there is but one cylinder for both intakes and exhaust, but in the Mead there are two cylindrical valves, one at one side for the intake and a similar one at the opposite side for the exhaust. The Itala has a vertical type, in which one valve acts as intake and exhaust for the two cylinders of a casting.

Two Types of Ring Valves

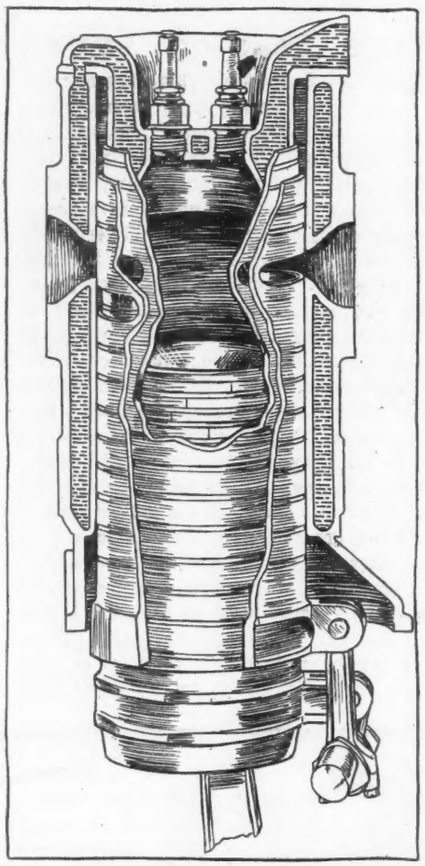
There are two types of ring valves, the reciprocating ring and the rotary ring. The ring valve very closely resembles the sleeve valve, excepting that in the sleeve valve the sleeves are longer than the cylinders, whereas the ring valves are very short and are carried in the cylinder combustion chamber. In the Sphinx or Reno type the ring is reciprocated and uncovers the exhaust port in the cylinder wall when it rises and uncovers the intake port when it lowers, whereas in the central position it covers both sets of ports. In the Cid motor the valve has a port cut in one side of it and it rotates and covers and uncovers the intake and exhaust ports in the cylinder walls.

The rotating disk valve as used in the Reynolds motor bears a strong resemblance to the rotating ring type in that it is carried in the top of the combustion chamber. The disk is like a flat plate, has a hole or port cut in one part of it of wedge shaped and in the cylinder head are intake and exhaust ports or openings of similar shape. As the disk rotates it covers and uncovers the intake and exhaust ports in the desired sequence.

The piston valve has not as yet any public exponent in America, but in England it is marketed. It consists of pistons similar to those used in a motorcycle motor in place of the poppet valves. These are reciprocated from a secondary camshaft. There are generally two pistons in each cylinder, one for the intake and one for the exhaust. Sometimes the pistons are placed on the same side and sometimes they are placed opposite each other, in one type that has been brought to this country one piston serves for both the intake and the exhaust in each cylinder.



KNIGHT DOUBLE-



THE KNIGHT SLEEVE VALVE

This explains the Knight valve principle. Inside of the cylinder are the two sleeves and within the inner sleeve is the piston. The sleeves have ports on opposite sides near their tops. These serve as valves. The right side ports are in register, in other words the valve is open. The left sides ports are not in register, meaning closed valve

Non-Poppet Problems

HAVING thus briefly outlined the different non-poppet valve types and before passing to descriptions of the different makes it might be well to dwell briefly on the problems that inventors are meeting with in the different types of non-poppets.

The non-poppet valve had the origin of its present popularity in its silence. It had its origin with the Daimler company in England, which company was manufacturing a motor with considerable noise when its attention was first drawn to the Knight two-sleeve type. The Daimler Knight types started the ball rolling in earnest in the quest for quietness, although Knight was gaining attention in this matter in America before he went abroad at the request of the Daimler interests. Since that time quietness has been much in demand and it has not only led to the development of many non-poppet valve types, but has also created new interest in the poppet valve type of motor and has made many of the poppet valve exponents refine their products both in the matter of enclosing the valve springs with metal plates, changing the cam contour and reducing the weight of the reciprocating parts.

Efficiency at Different Speeds

Once the point of quietness was gained for the non-poppet type of motor, the enthusiasts turned their attention to the subject of efficiency at different speeds. It is a well-known fact that with poppet valves when the motor attains very high speeds the valves do not seat properly and so there is lack of power due to loss in compression. This has been proven. With the non-poppet valve type the valve movement is positive, and is just as certain at very high speeds as it is at very low speeds. This created the talk of more general motor efficiency and of higher efficiency at many points in the range of motor speed. Increased efficiensy also became a live topic because of the larger openings that may be had for the intake and exhaust gases with some of the non-poppet types, particularly the sleeve types. With the double sleeve valve came the possibility of getting a very quick opening of the valve, a very quick closing and also a considerable wide open dwell. This meant increased volumetric efficiency, meaning more gas into the cylinder for explosion purposes and also more chance for a good cleansing out of the exhaust gases. This gaining of quick valve opening and closing with the long open dwell is being aimed at by every maker of non-poppet valve types. Some have gained it, an example being the two-sleeve type; others have partly gained it and

some claim to have gained it, but have not been able to satisfactorily demonstrate such. It is this factor that has led some makers of poppet-valve types to redesign their cams to obtain similar results.

The adequate lubrication of a non-poppet valve is one of the problems to be contended with. The reason consists in that the valve must of necessity be close to the combustion chamber and when the initial explosion occurs a tremendous heat is generated. This makes the lubrication problem difficult as the heat destroys the usefulness of the lubricant. Various schemes have been adopted to get around this difficulty. Hand in hand with the problem of lubrication comes that of gastightness. The valve, no matter what its type, must be gastight, otherwise when the piston is going up on the compression stroke, a fraction of the gas will be forced out around the valve, the compression at the moment of explosion will be much below what it should normally be and the power will be proportionately cut down. Compression rings, similar to those used in pistons, and a variety of other means have been introduced to eliminate this difficulty, and like the lubrication one it has been most satisfactorily coped with in the leading types.

The question with every non-poppet valve is its commercial status. A good valve can be designed, but can it be manufactured commercially and does it give continued good service in the hands of the owner? Some of the types have given specially attractive results and it is owing to this that many are turning to the non-poppet type and specially the sleeve valve which has shown special results in this respect. The upsetting of the general balance of the motor is eliminated, this occurring when exhaust valve springs lose tension after a few months use or when the valve seats become carbonized and a loss of compression results.

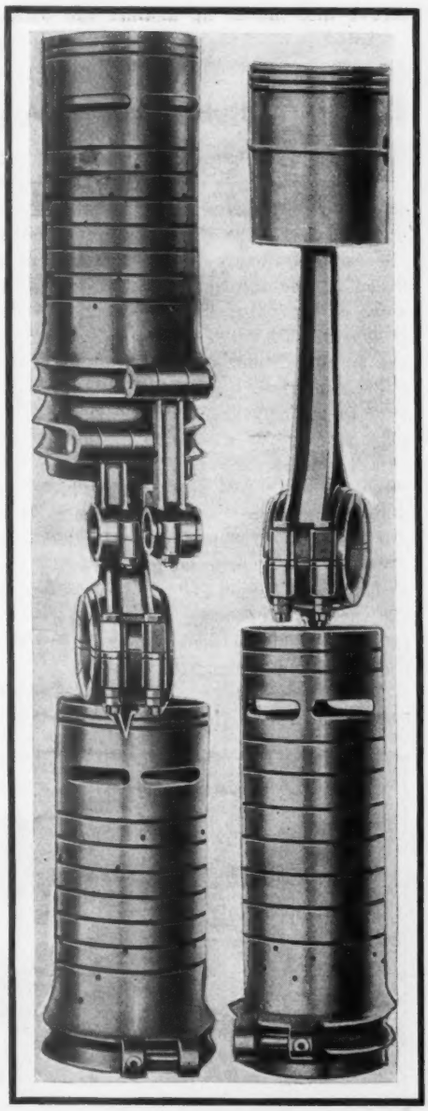
The Knight-Valve Type

THE Knight double-sleeve valve must be considered the practical pioneer in the non-poppet valve field. Before its actual use in a motor car other types of non-poppets had been tried out and discarded for various reasons; in some cases they were not practical and in others the public would not have anything to do with them. With the Knight it must be said that it was put into practical operation from the very start and was never marketed as a flotation proposition before it had proven its right to a place in the motor field. It must also be said of the Knight valve that it has remained unaltered in principle since it was first installed in an engine. The use of double sleeves and the characteristic relative timing of these have remained the same from the start and are accepted today by over a dozen different companies. There have been refinements in the matter of strengthening sleeve construction and lubrication, but these have been incidentals.

The Knight double-sleeve valve is the only

Knight Valve Types

one of its type using as it does two concentric sleeves positioned between the cylinder and piston. These sleeves are placed one inside of the other, much as the smaller-diameter part of a field glass slides inside of the larger-diameter part. Each sleeve is in length a little longer than the length of the cylinder. In the top of each sleeve are two semi-circular slots, one at the right side and the other at the left. In the cylinder wall are two slots on opposite sides to correspond with these. The slots on one side constitute the intake opening for the explosive gases to enter from the carbureter, the slots on the opposite side are for the escape of the exhaust gases. When the slots in the two sleeves register with the cylinder port on the one side the intake is open; and when the slots on the opposite sides of the sleeves register with their cylinder port the exhaust valve is open. Both sleeves are reciprocated, that is, moved up and down between the cylinder and piston, the piston working inside the inner sleeve. The reciprocation of the sleeves is vastly less than that of the piston. To begin with, they only reciprocate one-half as frequently, that is, to every twice that the piston goes up and down the sleeves go up and down once. The sleeve movement is short; in a 5.5-inch stroke motor, the piston goes up 5.5 inches and down the same distance, making a travel of 11 inches for each crankshaft revolution, but in this same motor the sleeves go up but 1⅛ inch and down the same amount. This means a very slow movement. If the motor were working at 1,000 revolutions per minute there would be a piston speed of 916 feet per minute, but the speed of the sleeve travel would be but 93.7 feet. This makes the lubrication of them a very simple matter.



PARTS OF THE KNIGHT VALVE

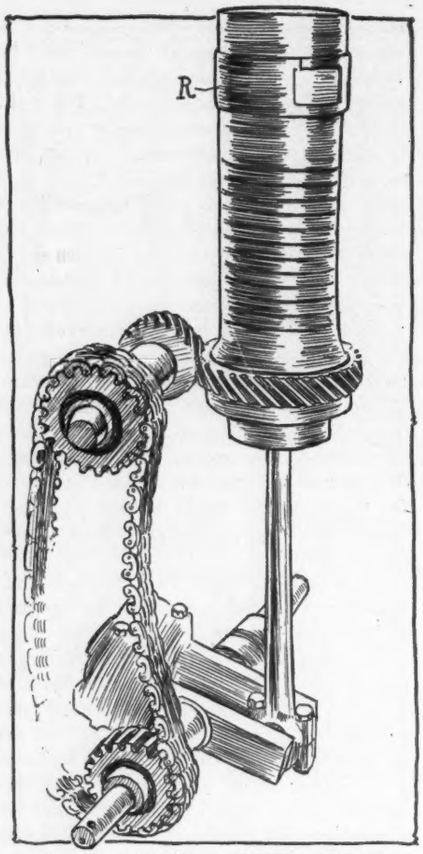
At the bottom are the sleeves, the outer one at the left being the shorter. In the upper left the sleeves are telescoped with each other and the piston inside the inner one

The sleeves are gray iron castings made approximately 5/32 inch thick and ground on inside and outside in manufacture. Each sleeve ends at the bottom in an enlarged ring or boss, which carries a lug on one side. To this lug the upper end of a short connecting rod attaches, the lower end of the rod spanning what is known as the eccentric shaft. This shaft corresponds with the camshaft in a poppet-valve motor and rotates at one-half engine or crankshaft speed. Each sleeve has a series of circular grooves on its outer surface for the distribution of lubricant.

Slots in the Sleeves

The position of the slots in the sleeves is a feature. The two exhaust slots are a little higher up on the sleeves than the two intake slots; and the intake slot in the outer sleeve is a little higher than that in the inner sleeve. The intake slot is for a motor 4.25 by 5.5, made .5 inch high and extends 124 degrees around the periphery of the sleeve. It is the same for both the inner and outer sleeve. The openings for the exhaust are larger, being ⅝ inch high and extending 124 degrees around the sleeve. Some conception of the size of such port can be obtained from the fact that the intake slot in each sleeve is equal in area to a rectangle 4.5 inches long and .5 inch deep, giving an opening area of 2.25 square inches for the intake and more for the exhaust.

The two sleeves do not reciprocate in unison; one is timed so as to operate about 70 degrees in advance of the other. Because of this lead there are times when both sleeves are moving in the same direction and then there are times when one sleeve is going up while the other is coming down. This has been done in order to get a quick opening and closing of the intake and exhaust. A quick intake opening and a quick intake closing are both very desirable in that they leave the entire space open for a maximum dwell and so give every opportunity of getting in a full charge of mixture. Using two sleeves makes this possible. The lead which one



C. L. C. ROTARY SLEEVE VALVE

In the French valve the sleeve is constantly rotated in one direction by chain drive as illustrated. The sleeve has one port for intake and exhaust, in its upper end

sleeve has on the other also permits of both sleeves travelling downwards at the start of the explosion stroke, at which time the maximum side thrust of the piston against the sleeve is taking place. Both sleeves are moving in opposite direction to the piston on compression and exhaust strokes when the piston side thrust is minimum. The intake port is open for more than 220 degrees on the flywheel—180 degrees represent one-half a flywheel revolution, so that the valve is open for considerably more. In a word, it is open from top dead center to 40 degrees past the bottom dead center. As already stated, it opens and closes quickly, as a matter of actual operation, it gets 50 per cent of its opening in 20 per cent of the time it has in which to open and close. It remains at the point of maximum opening for 15 degrees of flywheel rotation and has a more progressional closing.

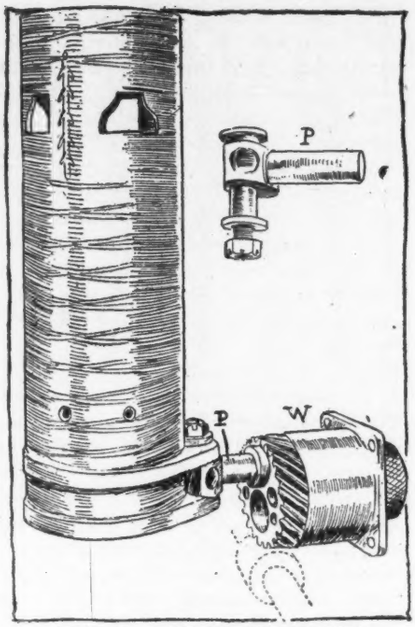
In all of the motors using the Knight double-sleeve valve the cylinders are made with detachable heads, which are entirely waterjacketed. The cylinder head is made concave or hemispherical in shape and so provides a combustion chamber which is roughly spherical because of the hollowed piston head. Gas tightness is a necessity in the non-poppet valve motor. The only point in the double-sleeve valve where leakage could occur is at the top of the sleeves, the gas leaking up around the top of the sleeves. To guard against this compression rings, the same as used in a piston, are carried in the cylinder head and bear upon the inner sleeve. There is one wide ring, wider than the slot in the sleeve, and above it are two narrow split rings, which work as effectively as the ring in a piston in a poppet valve motor.

Lubrication is invariably advanced as one of the big problems in non-poppet motors. This is because the valve must be placed close to the combustion chamber where the heat is intense at the moment of initial explosion. This heat tends to destroy the usefulness of the oil; in a word, it carbonizes it and the carbon may later score the cylinders. The dynamic feature of the two-sleeve type which aids lubrication is the large bearing area of the sleeves as well as the larger body of sleeve which is not exposed to the flame during combustion, and this unexposed part rapidly draws off the heat from the exposed portion. The exposed portion of the sleeve also moves up against the water-jacketed part of the cylinder head, giving opportunity for rapid radiation.

Rotary-Sleeve Valves

THE rotary-sleeve valve has had few exponents outside of France. This type of valve consists of a full length sleeve placed between the cylinder and the piston, the valve rotating in one direction at a speed of one rotation for each two rotations of the crankshaft. The present exponent of this valve is the CLC., a car of the single-cylinder type at present on the French market. There is but a single port in the upper end of the sleeve, this port serving for admission of intake and escape of the exhaust gases. In the cylinder wall are two ports with which the single sleeve port registers. These ports are placed at 90 degrees to each other, the rotating sleeve first registering with the exhaust and immediately afterwards with the intake. Following the closing of the intake is a long closed period during the compression and explosion strokes.

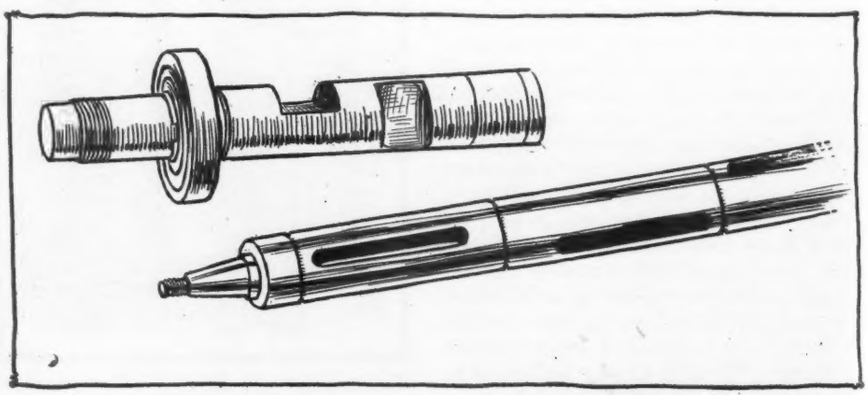
The rotating sleeve is gear driven at its lower end, where it carries a circular boss



ARGYLL SEMI-ROTARY VALVE

The Argyll valve has a very peculiar action; it reciprocates vertically and also has a back and forth motion

in which is cut a circle of spiral teeth, these teeth taking the drive from a corresponding pinion on a horizontal shaft along the cylinder side. This horizontal shaft is in turn driven by silent chains from the crankshaft. The sleeve is supported on a double race of annular ball bearings at its lower end, which bearings serve also as thrusts to support the sleeve. The sleeve carries a very wide compression ring in the same plane as the port, and having a corresponding port or hole in it. This ring is pinned in position and rotates with the sleeve. Being outside of the sleeve the ring is not subjected to the direct heat of explosion, and due to its extensibility it maintains gas tightness. Two other smaller compression rings, in size approximately the same as used in an ordinary piston, are for lubrication purposes and are not needed in maintaining gas tightness. There is a possibility of the rotating piston rings grooving the cylinder wall.



THE DARRACQ AND MEAD ROTARY VALVE TYPES

In the upper left is a section of the rotary cylinder valve used in the Darracq. It is cut away at places to pass the gases. The lower right shows the rotary cylinder valve used in the American Mead motor. It has slots cut in for gas admission and freeing exhaust

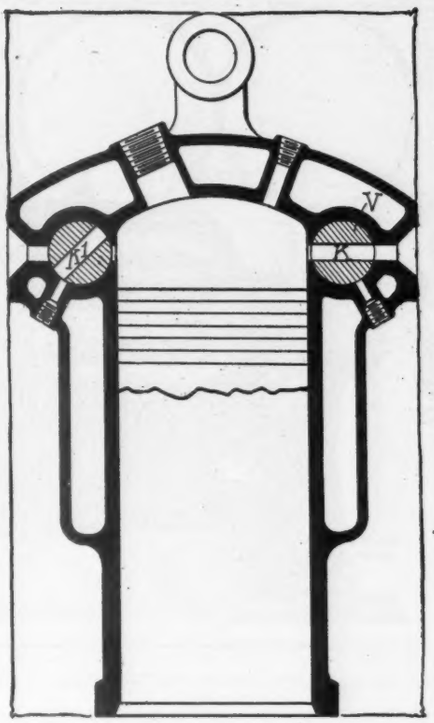
Double Motion Sleeve

THE Argyll single-sleeve motor differs from the Knight two-sleeve type in the employment of one sleeve instead of two. This one sleeve has two movements; it moves up and down in the cylinder and has also a slight rotary movement, rotating to the right as the sleeve ascends and to the left as it descends, so that if you were to select a point on the sleeve and it should scratch a mark on the cylinder wall that mark would be elliptical in form. The sleeve is, as it were, a liner placed between the cylinder wall and the piston. It moves up and down during two complete crankshaft revolutions; in short, it reciprocates just half as often as the piston. This sleeve is operated both up and down and part rotary by a wheel W in which is a pin P, which pin attaches to a lug on the lower end of the sleeve. The wheel W is rotated by gear from the crankshaft of the motor. The pin P is free to move in and out in its slot in the wheel W, such movement being imperative when the pin occupies the 3 o'clock and 9 o'clock positions in rotation. When the pin is at the 12 and 6 o'clock positions the pin is in furthest. This pumping action of the pin in its socket aids in lubricating the adjacent parts.

Opening in Each Sleeve

In order to cover and uncover properly the intake and exhaust ports in the opposite sides of the cylinder wall, each sleeve is supplied with five openings or ports in its upper end, each being square shaped with one corner cut away. Each cylinder has six ports cut in the cylinder walls, three of which communicate with the intake manifold and three with the exhaust manifold. The inlet ports are opened by the rotation of the sleeve at the bottom dead center and remain open on the upward movement of the sleeve and the exhausts are opened on the downward movement of the sleeve.

The sleeve has little rotation on its upward or downward movement, its maximum rotation being when the sleeve is at the top dead center and also at the bottom dead center. When the sleeve is at the upper center all of the ports are closed and the explosion takes place. Any one of the five holes in the sleeve might serve to uncover an exhaust port on the down movement and an intake port on the up travel but this would complicate the intake and exhaust piping; as a matter of fact the holes are cut in sleeve so that only one of them serves for both intake and exhaust purposes and of the remaining four, two perform intake functions and two exhaust functions. Thus the five holes in the sleeve care for the six ports in the cylinder wall. The movement of the sleeves in uncovering and covering the openings is so set that there is a maximum of speed at the start of the opening and also at the end of the closing, this providing a maximum opening, which should insure a full charge as well as complete exhaust.



MEAD ROTARY CYLINDER VALVE

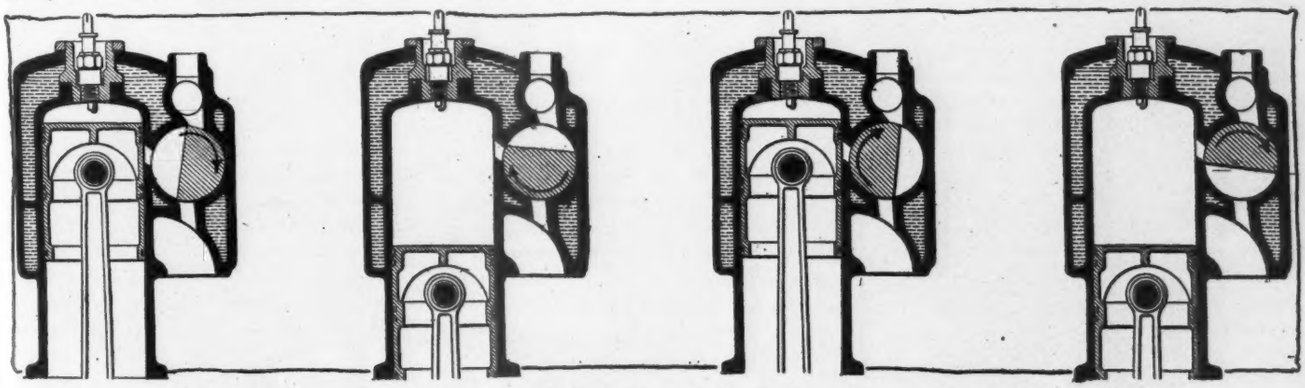
This is a T-head motor with a rotary valve at each side of the cylinder head, one valve for the exhaust and the other for the intake. Both are waterjacketed

Mead Cylinder Valve

THE Mead rotary cylinder valve, the product of the Mead Engine Co., is perhaps one of the simplest types. The motor is a T-head design, with intakes K on one side and exhaust K1 on the other. Lying longitudinally along each side, in a compartment similar to that for the poppet valves, is a cylindrical cast iron bar V 1⅝ inch in diameter and having four slots cut in it, one for each cylinder. The valve cylinder on the one side is for controlling the intake gases and that on the other side for the exhausts. Both are driven at one-quarter crankshaft speed through a vertical shaft at the front end of the motor, this shaft carrying a worm on its upper end for meshing with gears on each of the rotary valves. This type of valve was well tested out on a motor 4 by 4.5. In this motor the exhaust slot in the valve for each cylinder was 3.75 inches long and 7-16 inch high, giving an opening area of over 1.6 square inch. In the intake valve the opening was not quite so large, measuring 3.75 inches long and 5-16 inch high, or an area of .86 square inch. The width of the slots is varied according to the motor sizes and also in accordance with the timing used. With a 5-16-inch intake slot the valve starts opening 10 degrees after dead center and remains open until the piston is 40 degrees past the bottom dead center. The exhaust is set to open about 73 degrees before the piston is at dead center and is set to close at top dead center, or 5 to 10 degrees after.

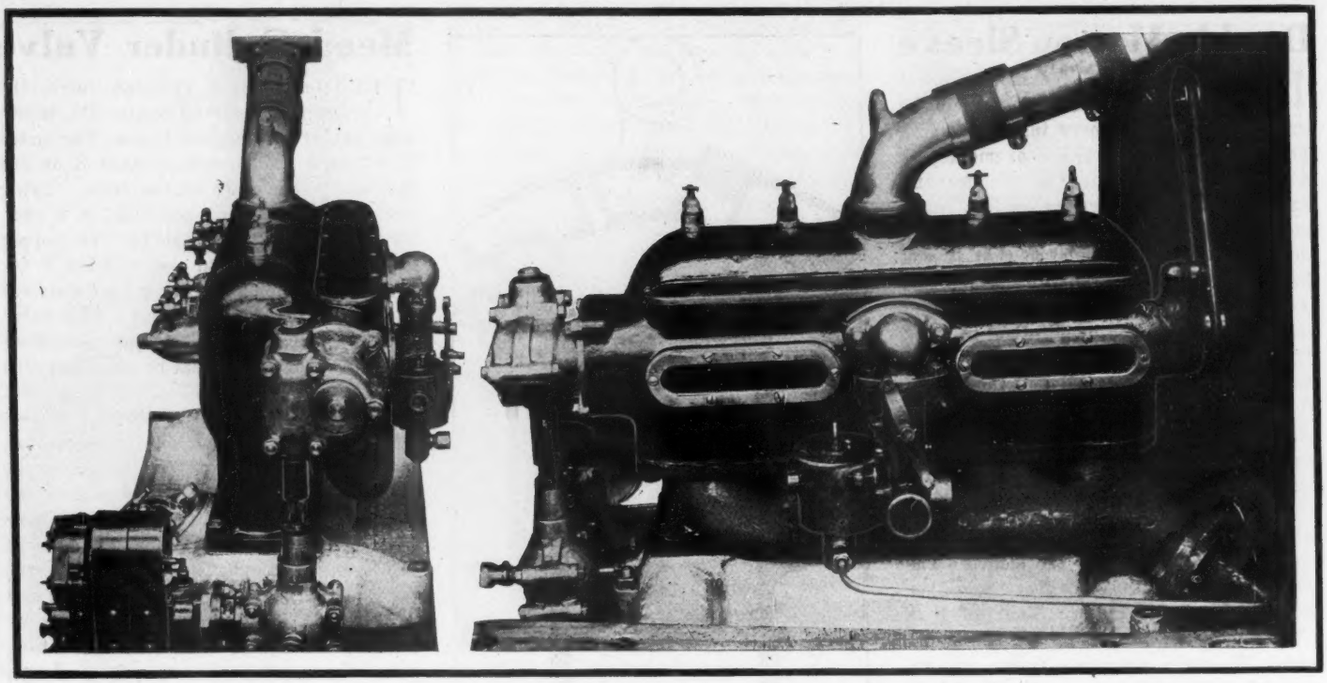
Clearance of Valves

Both intake and exhaust valves are made with a clearance of .0015 inch at the points where the valve has bearings in the cylinder castings and with a clearance of .002 inch where the slots are cut in the cylinder. Cooling and lubrication are always problems in rotary cylinder as well as all other valve types and in the Mead the waterjacketing of the entire valve on both intake and exhaust sides is looked to to partially solve this problem. Each valve is also lubricated at five points by oil fed under pressure from the motor lubrication system. Oil grooves are cut in the valve surface to distribute the lubri-



DIAGRAMS ILLUSTRATING DIFFERENT POSITIONS OF THE DARRACQ ROTARY CYLINDER VALVE

From left to right the valve positions are, Induction compression, explosion and exhaust. The arrow indicates the direction of rotation of the rotary valve, shown in D section. This valve is carried on two races of ball bearings and is water-cooled



FRONT AND SIDE VIEWS OF DARRACQ MOTOR FITTED WITH ROTARY-CYLINDER VALVE

cant. With this valve a hemispherical combustion chamber is possible and ample water-jacketing of the head also is possible. The motor in which this valve has been tried out for months is a four-cylinder one with the cylinders cast en bloc. Were the cylinders cast in pairs it would call for either a universal joint in the valve between the cylinder pairs or else placing the valve driving mechanisms between the cylinder pairs, in which case each valve would be cut in two; namely, there would be a one-piece valve for each pair of cylinders.

Darracq D-Type Valve

THE Darracq valve is a rotary cylinder type. The rotating member is a D-section one where the gases enter, placed horizontally along the side of the cylinder head much as the valves are located in an I-type motor. It serves both for intake and exhaust purposes. This is possible in that the barrel-shaped chamber carrying the valve has three orifices for each cylinder, one connects with the cylinder and the other serves for the intake and the exhaust passages. As the valve rotates it puts the cylinder into communication with either the intake or exhaust passage, according to the cycle of operation. The valve is driven by gearing at one-half crankshaft speed, and it is in one piece for the four cylinders. The illustrations show the D-section in different positions. In the exhaust position the valve shuts off the intake and leaves an unobstructed passage from the combustion chamber to the exhaust manifold; in the suction position a similar unobstructed passage is provided from the intake manifold into the combustion chamber, and for the explosion and also for compression the curved part of the valve entirely obstructs the passage into the cylinder.

A feature of paramount importance in this valve is that the cylinder port or opening is entirely covered by the piston during the first interval of the explosion so that the valve is protected from the intense heat at the point of maximum temperature and is also freed from the pressure of the explosion at the same time. This makes the problem of lubricating the valve much simpler than were the heat allowed to come in contact with the valve during the entire explosion period. Due to the fact that the piston automatically closes the port to the cylinder means that the intake opening is delayed and also that the exhaust closing is made earlier. There is a small portion of the exhaust gases retained, which in practice has not been considered a serious defect.

Although the criticism has been made that many rotary valves mean high-compression motors, in this one the cold compression is 70 pounds. The intake valve, due to the piston masking the cylinder port, does not open until the piston has traveled one-seventh downward on its stroke, which represents 25 degrees on the flywheel, but the ports remain open until the piston is 25 degrees past the dead center, leaving the port open for 180 degrees. The inventor, C. E. Henriod, claims a quick opening, and a dwell at full opening, for this valve, although it has been argued that such is not possible with a rotating cylinder valve, due to the uniform rotary speed at the surface of the valve. The inventor claims, however, to have the quick opening and also the full-open dwell by making the ports in the valve or distributor several times the width of the ports in the cylinder walls. In this way full opening is obtained for a fifteenth revolution of the valve, with the same loss in closing. The inlet is claimed to be at full open position for 132 out of the 180 degrees in which the valve is open.

The Darracq valve or distributor as it is called is approximately two-thirds the diameter of the cylinder. It is carried on a large annular ball bearing at the end, a central bearing having been considered unnecessary. The bearing end of the Darracq rotary valve and part of the driving mechanism are shown at the left of the illustration on page 54.

Itala Four-Fold Valve

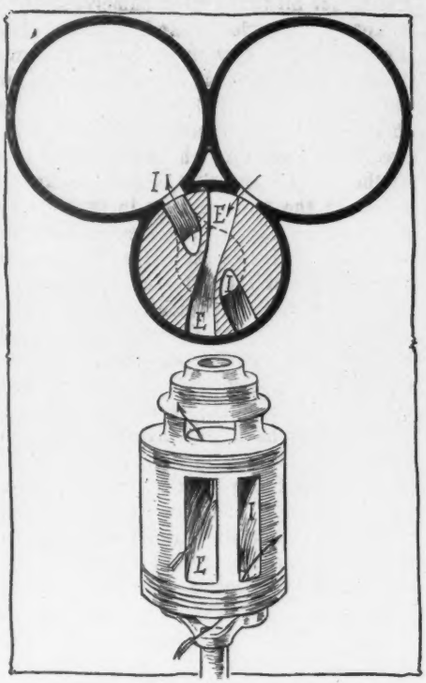
THE Itala company of Italy is actually marketing a rotary cylinder valve which is a vertical type, with a single valve to supply the intake and exhaust ports for two cylinders, the valve being located in the angle between the cylinders. These valves, of which there are two for a four-cylinder motor, rotate at one-quarter crankshaft speed and are driven by helical gears from a halftime shaft, namely, a shaft occupying the same position inside the crankcase and being driven from the crankshaft and at one-half its speed. Each valve is nearly as large as the main pistons in the cylinders. In a motor with 105 millimeter bore the diameter of the cylindrical valve is 100 millimeters. Each valve rotates in a cylindrical space in the cylinder casting, this space having two vertical ports in its wall, each being 20 millimeters or ⅘ inch wide, each port connects direct with the combustion chamber of the cylinder it is adjacent to. There is but one port for each cylinder; this acts at one time to admit mixture and at the next to let the exhaust out. At the bottom of this valve chamber is an orifice connecting

with the intake manifold and at the top an opening connecting with the exhaust.

Inside of this valve chamber is the rotating valve, which is in reality a close fitting rotary piston. It has four vertical slots cut in its side. Two of them are placed diametrically opposite to each other and are for intake purposes; and the other two spaced a short distance from the first pair are for the exhaust. The inlet and exhaust ports have not any intercommunication with each other. As illustrated, the intake passages are placed in the lower half of the valve, with the exhaust passages in the upper half, with what resembles an inverted cone partition separating them. There is a clear passage between the inlet ports and the base of the valve; and between the exhaust ports and the top of the valve.

Its operation is simple: As the valve rotates at one-quarter crankshaft speed one of the intake ports serves both cylinders for one suction stroke and the other intake port serves them on the next intake stroke. Only one intake port therefore is in use at once and they alternate in their work, each serving the two cylinders. The same is true of the two exhaust ports; they alternate in work.

The timing of the valve is a delicate job in that each valve performs four functions, namely intake and exhaust, for two cylinders—that is, it serves for four valves, the exhaust and the intake on each of two cylinders. In following the exact operation of the valve it should be borne in mind that the sequence of firing in the cylinders is taken into consideration, this firing order being 1, 4, 3, 2. Keep in mind also that there is but one port into each combustion chamber and that it serves as an intake and also as an exhaust passage. Bear in mind also that the ports into the two cylinders are very close together, there only being a strip of metal separating them, equal in width to the width of the port for the exhausts in the rotating valve. When No. 2 cylinder is exhausting and the piston is near the end of the exhaust stroke, No. 1 will be at the bottom of the firing stroke and ready to begin exhausting so that as the rotating valve has just closed the port in No. 2 cylinder it will almost immediately begin opening the exhaust for No. 1 cylinder. Between the exhaust and intake ports in the rotating valve is just enough metal wall to cover the port into the cylinder and so as soon as a cylinder port is closed to the exhaust the intake opens.

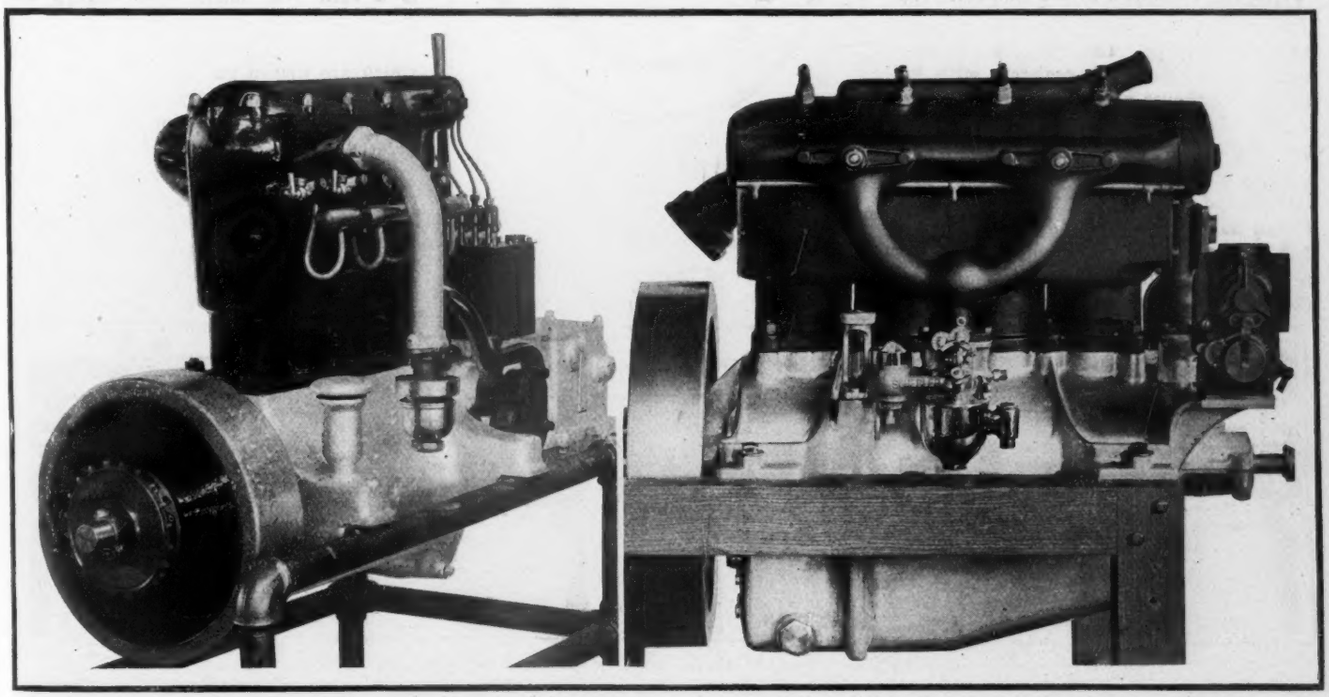


ITALA ROTARY-CYLINDER VALVE

This valve consists of a vertical cylinder, one for each pair of cylinders and it serves for both intaket and exhaust purposes. It rotates at one-quarter crankshaft speed and is driven by gearing from the crankshaft.

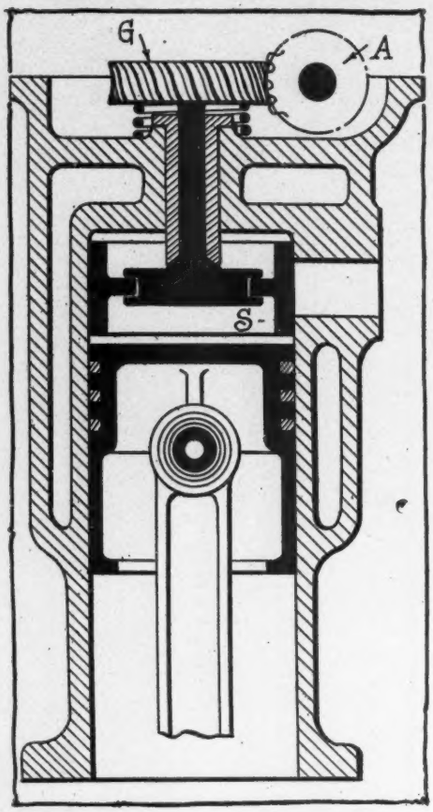
The Itala, as well as all other types of valves, must be made compression tight. It carries compression rings at its upper and lower ends. The lubrication of this valve is simplified because of its large diameter and slow movement. Provision is also made to protect the valve against the enormous side thrust due to the explosion within the combustion chamber. This has been guarded against by drilling a hole diametrically through the valve and the wall of the valve chamber is recessed opposite to this, to give a balanced effect. Each valve is driven by a vertical spindle which is in turn driven from a longitudinal shaft within the crankcase.

Before dismissing the question of rotary cylinder valves it would be proper to refer specially to the Elmore used on its two-cycle motors, although the primary object of this story is to deal with non-poppet valves as used in four-cycle motors. In the Elmore the rotary cylinder valve is carried in the side of the crankcase, where it is entirely away from the flame and heat of combustion. This valve, or distributor serves merely for the intake gases, the exhaust gases escaping out of a port in the opposite side of the cylinder which port is covered and uncovered by the main piston in its regular reciprocation work. The problem of lubricating a rotary valve or distributor, which has cold gases passing through it all of the time is a very simple one.



REYNOLDS MOTOR WITH DISK VALVE AND MEAD ROTARY-CYLINDER VALVED MOTOR

Cid Rotary Ring Type



THE CID ROTARY-RING VALVE

This valve consists of a narrow ring mounted in the combustion chamber. It, is constantly rotated in one direction and has in it one port which covers and uncovers the intake and exhaust ports in the cylinder wall. In the illustration S marks the rotating ring, G the gear which drives it and A the camshaft which lies along the cylinder heads and drives the several gears G

THE Cid valve is a rotary ring type, the ring being located in the cylinder head above the piston. This ring has a large slot in one side which registers with intake and exhaust ports in the cylinder to admit mixture and give free passage to the exhaust. The valve is rotated by gearing at one-half crankshaft speed. The intake and exhaust ports are not positioned at opposite sides of the cylinder, but approximately at an angle of 98 degrees to each other, and the timing of the valve is such as to have the proper timing for all four cycles, namely, suction, compression, explosion and exhaust. The diagram shows how these four cycles are obtained, by the position of the ports at 98 degrees. Gas tightness is secured in this case without the use of any compression rings, through the extensibility of the valve. The ring is free to expand owing to the port opening in it, and the greater the explosion pressure, part of which occurs inside the valve, the greater the pressure of the valve against the cylinder wall and consequently the less liability of gas leakage. Gas tightness around the vertical spindle which carries the ring is obtained by tapering the lower end of the spindle where it unites with the valve and by having a corresponding cone seating on the spindle bushing.

This valve being located entirely within the combustion chamber of the motor, which is the hottest part, is subjected to the intense heat of initial explosion, and so adequate lubrication must be provided for this purpose. This is specially so as the valve is free to expand diametrically and so press heavier against the cylinder walls.

The details of rotating the valve in each cylinder are readily accomplished by an overhead shaft extending from front to rear of the motor, this shaft carrying a worm to drive the gear on the top of each spindle.

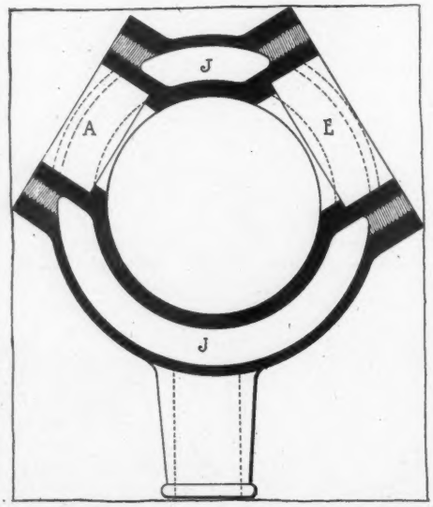
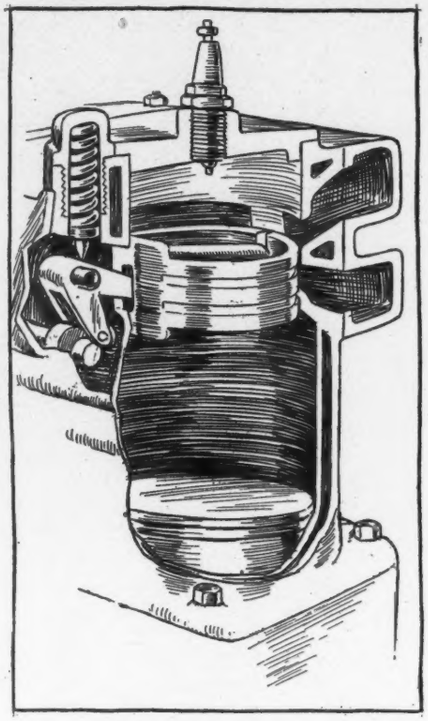


DIAGRAM FOR C. L. C. AND CID, SHOWING INTAKE A AND EXHAUST E AT 90 DEGREES TO EACH OTHER

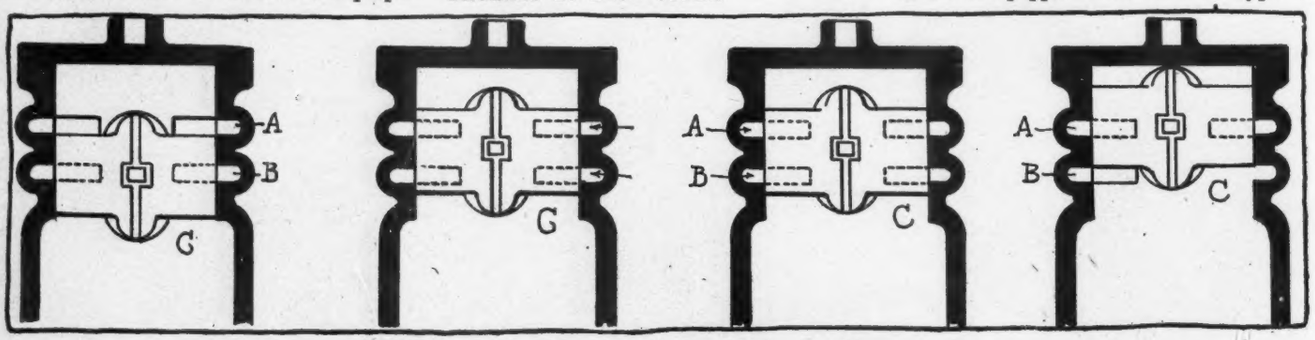
Sphinx Ring Valve



THE SPHINX RING VALVE

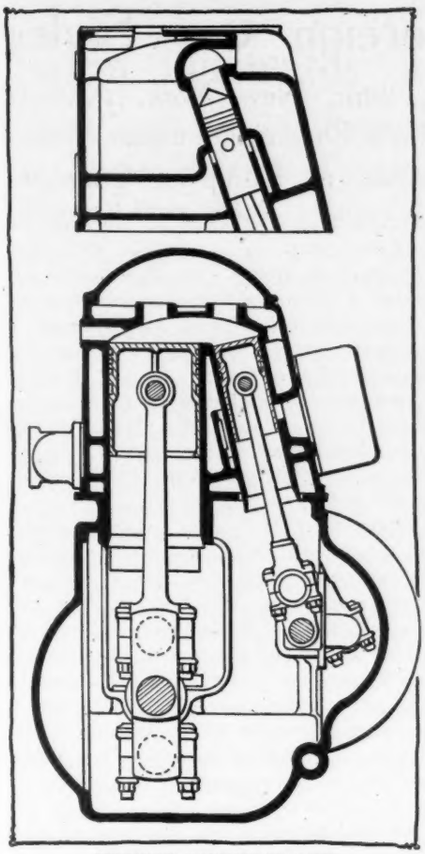
This ring valve is mounted in the combustion chamber but it is given a short reciprocatory movement, so as to cover and uncover the intake and exhaust openings, both of which are on the same side of the motor. When the valve lowers it opens the intake and when it rises it opens the exhaust valve

THE Sphinx is a reciprocating ring valve located in the combustion chamber directly above the piston, and is an evolution of the Reno type brought out in France during the latter part of 1910. The valve is a split ring made wide enough and given sufficient reciprocation to cover and uncover the intake and exhaust ports, which are placed one above the other in the same side of the cylinder head. The ring is reciprocated through a bellcrank pivoted in the cylinder casting, the long arm of the bellcrank entering and hinging to the ring and the short arm carrying a roller which contacts with a cam on a camshaft carried along the side of the motor in approximately the same position as are the poppet valves in an L-type of



FOUR POSITIONS OF SPHINX RING-VALVE IN OTTO CYCLE

From left to right the positions are: Suction, compression, explosion and exhaust. C is the reciprocating ring valve, A the intake opening and B the exhaust opening. Both are nearly circular and provide large intake and exhaust openings



HEWITT PISTON VALVE

In this motor two pistons are used for each cylinder, one for the intake and the other for the exhaust. Both incline inwards at the top

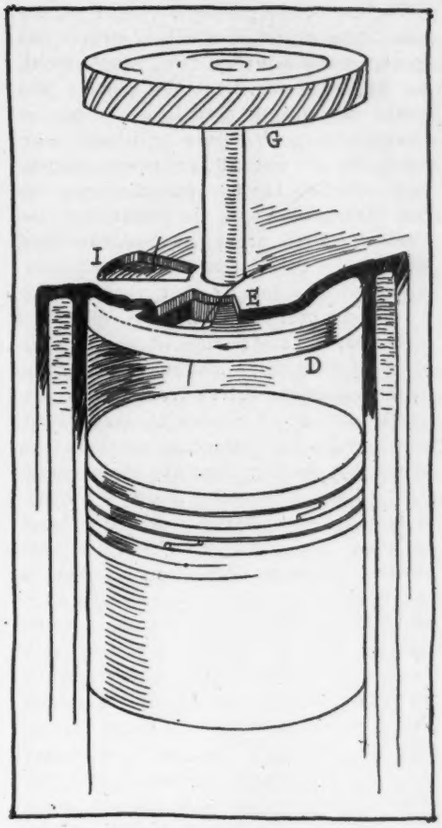
motor. The movement of the cam raises the ring valve and a spring bearing upon the long arm of the bellcrank forces the ring down. The ring has a slight movement, being less than 1 inch for a motor with 5.5-inch stroke. The ring is a gray iron casting with a face depth of 1.5 inch. It is split diametrically opposite to where the bellcrank arm enters the hollow bearing block, the purpose of the split being that the ring may expand against the cylinder walls, thereby preventing leaking of gas and eliminating the necessity of compression rings. In this valve the cool intake gases enter above the valve and flow down through its interior, a fact which aids materially in cooling it and so facilitates the lubrication problem; and the exhaust gases escape underneath the valve.

The size of the intake and exhaust openings is an important consideration. The larger the opening the better the explosive charge and the quicker the exhaust. This valve has a claimed opening of 2.5 square inches for a motor with 3.9 inches bore and 5.5-inch stroke. This is considerably in excess of that in many poppet-valve motors. These large openings are made possible by the peculiar construction of the cylinder around the combustion chamber in which the valve is carried. The cylinder wall has two annular spaces, one communicating with the intake manifold and the other with the exhaust manifold. Large circular ports are cut through the cylinder wall uniting these spaces with the combustion chamber, so that inrushing mixture enters the cylinder at all sides and equal freedom is afforded the escape of the exhaust.

Reynolds Disk Valve

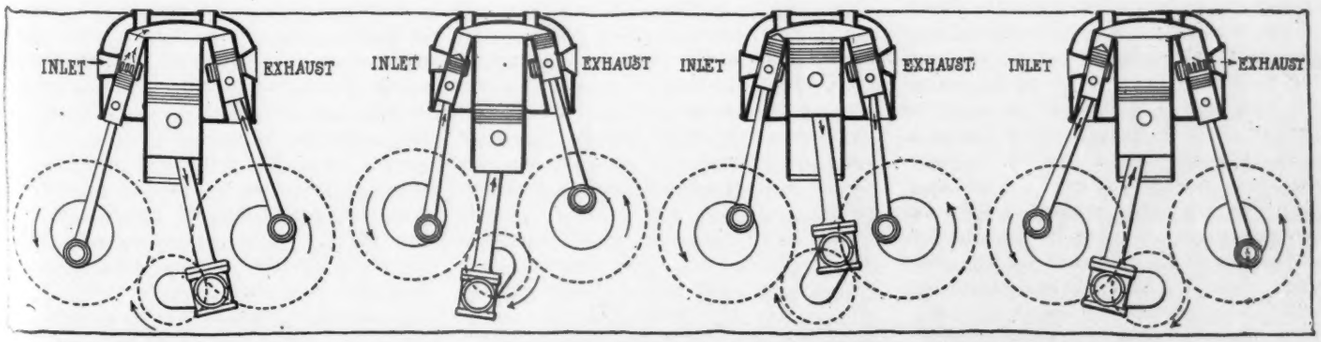
THE rotary disk valve has been exploited but little abroad and in America has had an exponent in the Reynolds type, which has been built for some time for marine motors and which has been under expeiment by several engineers for car purposes during the past 12 months. The Reynolds Motor Co., a Detroit corporation, has been organized expressly to develop this valve for car use. It is a revolving flat disk positioned in the cylinder head. In diameter the disk is approximately the same as the cylinder bore. The disk has one segment opening of broad wedge shape which covers and uncovers ports in the cylinder head, one port for the intake and the other for the exhaust. The disks are rotated at half crankshaft speed. The method of driving the disks is through a train of gears along the top of the motor, one gear for each cylinder, the gear lying horizontally above the head of the combustion chamber, and the gears above adjacent cylinders meshing. This train of gearing is driven through a vertical spindle at the front end of the motor. This spindle carries a spirally cut gear on its upper end which meshes with the first gear of the train.

Each valve is a heavy disk with a short vertical stem which extends upwards to receive the drive from its gear. Each valve seats against the cylinder head, and small holes are drilled in the disk face in which can collect any carbon particles due to burnt oil, the carbon collecting in these holes to avoid scoring of the head of the combustion chamber. The lower face of the valve receives the entire force of the combustion and also the intense heat of initial explosion. Precautions have been taken in the lubrication of each valve by leading an oil duct to the top of each valve stem so that the oil flows down around the valve stem and thence spreads over the face of the valve. The motor in which this valve has been developed has 3.5-inch bore and 4.5-stroke.



REYNOLDS DISK VALVE

In the head of each cylinder is a rotating disk D with a single port which covers and uncovers exhaust port E, as intake port I. It is driven by the gear G



THE FOUR POSITIONS OF THE HEWITT PISTON VALVE

In this illustration taken from the Automotor Journal, the piston valves are shown on opposite sides to explain the parts. The four positions from left to right are: Suction, compression, explosion and exhaust. The pointed top of the intake piston is plainly seen

The use of the piston valve has not developed as expected, which is largely due to the manufacturing cost. The Hewitt, an English product, is the pioneer and leader and is in actual use today on Crowdy cars, which are built and marketed in 19 and 29-horsepower models. Each cylinder has two piston valves, one for the intake and the other for the exhaust. Both are placed on the same side of the cylinder and both incline inwards at the top so that the capacity of the combustion chamber is held to a minimum, a construction at one time in use on poppet-valve motors. Both of the piston valves are driven from a secondary crankshaft, which rotates at one-half engine speed. This secondary crankshaft is driven by gearing from the main crankshaft. Each piston valve is simply a smaller piston, reciprocating in a water-cooled cylinder. The piston carries three compression rings, as does the big piston in the working cylinder. The intake pipe connects with the side of one piston valve cylinder and the exhaust manifold with the side of the other valve cylinder. When the intake is open the top of the intake piston, which is pointed, is below the intake openings into the valve chamber; and when the exhaust passage is open the exhaust valve is below its exhaust manifold opening. The timing of both intake and exhaust valves is such that they receive an explosive impulse which drives them downward, thereby making them partially self operating. When the explosion strokes takes place both valves are at the top of their cylinder chambers. On the compression stroke both move up, the exhaust leading. The exhaust piston moves upward on the induction stroke. The lubrication of these valves is the same as the lubrication of any piston.

Many different designs of piston valve have been presented to the public from time to time, but none of them, save the Hewitt, has reached the practical stage. Some have used one valve for the intake and exhaust of each cylinder, the valve piston being really a double hollow piston, the upper half, namely, that part above the piston, doing intake valve duty and that part beneath the pin doing exhaust valve duty.

The Hewitt pistons have a comparatively long stroke, about two-thirds the stroke of the working piston. It is claimed that the eight valve pistons instead of drawing upon the power output of the motor for operation actually add to it. The further claim is made that the torque is more equalized. On a part of the cycle the two piston valves are traveling with the explosion pressure; at other times they are traveling in the direction of the compression pressure, taking power away from the main piston; whereas at other times they assist the working piston. It is generally admitted that a four-cylinder piston-valve motor has a superior torque to a four-cylinder poppet-valve.

Importers Show Foreign Car Styles

Annual Salon, Held in Hotel Astor, New York, Attracts Fourteen Different Concerns Which Display Nineteen Makes of Machines, Representing Product of European Countries

NEW YORK, Jan. 2—Special telegram—Following its usual custom, the Importers' Automobile Salon is at present engaged in showing to the American public the latest things in motor car construction from the foreign view-point. The annual show of cars made in Europe opened this evening in the Hotel Astor and for the next week will hold forth in the magnificent ballroom of the big hostelry.

There are fourteen exhibitors showing nineteen different makes of cars, the leading European countries being represented in the display. Most of the makes are well known in this country, but there are at least two—the Pic-Pic and the Zedel—which are making their bows. The list of exhibitors includes the Benz Auto Import Co., Benz; Ducasse & Co., Darracq and Charron; Paul Lacroix Automobile Co., Renault, Daimler, Itala, Zedel and Clement-Bayard; de Dion-Bouton American Branch, de Dion; Fiat Co., Fiat; J. M. Quinby & Co., Isotta-Fraschini; Mercedes Auto Import Co., Mercedes; Metallurgique Motor Co., Metallurgique; Minerva Motors Co., Minerva; Napier Automobile Co., Napier; Panhard & Levassor, Panhard; Piccard-Pictet, Pic-Pic; Renault Freres, Renault; T. E. Adams Co., S. P. A.

A study of the show displays many remarkable features, not the least of which is the great showing made by the non-poppet type of engine, 33⅓ per cent of the motors being of this style, and including the Panhard, Mercedes, Minerva and Daimler, using the Knight; the Darracq the Henriod and the Pic-Pic the Argyll. There also is a good showing made of engines using the monobloc type of cylinder casting, while with the foreigners the chain continues in use, although in each instance where it is fitted the bevel gear also has a footing. Minerva, Darracq and Daimler use worm drive, the Isotta has a front-wheel brake on one model, and the Napier is the only one using wire wheels.

Among other points of interest are the eight-cylinder de Dion 4⅛ by 5½; and the 120-horsepower Isotta, which is remarkable from the fact that it employs six brakes. The body styles are luxurious and one of those that attracts attention is the Napier cabriolet, which is convertible and can be turned into a touring car very easily. A short description of each exhibit follows:

Benz—Two chassis types of this make are on display, but there are several of each size equipped with a variety of body styles. The two chassis shown are the stock 30 and 50-horsepower cars. The big car is approximately 5 by 6 inches in its cylinder measurements and varies only slightly from the model of this size put out last year. It is equipped with tires 36 by 5 all around. On this chassis are fitted a Brewster limousine and a semi-closed body and a Quinby torpedo in royal coronation purple with gold stripings and gold-plated bright work. In the 30-horsepower chassis, two bodies are shown, one a Brewster limousine and the other a Quinby limousine. Besides these cars a stripped and polished chassis of the 30-horsepower model is displayed.

Charron—The Charron exhibit consists of three models, a 30-horsepower landaulet, 22-horsepower limousine and a 15-horsepower town car. The first of these has an engine the cylinder measurements of which are $4\frac{5}{16}$ by 5⅞ inches. The second has a monobloc motor 3¾ by 5⅛ inches, and the smallest-powered car also has a monobloc motor $3\frac{5}{32}$ by 4¾ inches. While chains are used in some of the large models, the drive system of the show cars is by cardan shaft.

Clement-Bayard—Two low-powered six-cylinder chassis are shown of this make, one being rated at 15-20 horsepower and the other at 20-30 horsepower. The mechanical features are twin cylinders in one casting, automatic carbureter, radiator on dash, three-speed gearset and final drive by propellor shaft. Accessibility is emphasized in the construction of the Clement-Bayard cars.

Daimler—Two chassis types are included in the Daimler display. First is a six-cylinder Knight car fitted with a fore-door touring body. The engine of this car is rated at 38 horsepower. The other car is a 25-horsepower car with landaulet body. The lubrication system is the chief feature of this make aside from the fact that all its models are fitted with Knight engines. This consists of the automatic device for varying the dip of the troughs to correspond with the opening and closing of the throttle. All Daimler cars are fitted with worm drive.

Darracq—Only one model of this make is shown. It is a 16-25-horsepower car equipped with the Henriod rotating-sleeve motor which has caused something of a sensation in France this year. The Henriod principle differs materially from the Knight idea. The cylindrical distributing sleeve is placed on the side of the cylinders, somewhat below the top of the piston stroke, to avoid excessive heat. The sleeve is actuated by half-time gearing from the crankshaft. It does not come into actual contact with the surface of the casing and is carried at each end by ball bearings. The rear axle contains a new feature in that the old bevel gears

Salon Illustrates the European Trend

Non-Poppet Engines Represented on 33⅓ Per Cent. of Cars, by Three Different Types; Knight, Henriod and Argyll—Worm-Drive Also Seen—One Eight-Cylinder Motor Shown

have been supplanted by a worm drive. The water pump and fan have been abandoned.

De Dion-Bouton—One of the largest exhibits is the display of this make. There are eight models displayed, either as complete cars or as stripped chassis. The largest shown is one equipped with an eight-cylinder motor 120 by 130, rated at 100 horsepower. The wheelbase is 142 inches. A 30-horsepower chassis of the eight-cylinder type and one equipped with an inside drive landaulet body; a 40-horsepower, four-cylinder touring car, a 20-horsepower touring car, a 20-horsepower limousine, and a chassis and five-passenger touring car of 10 horsepower, complete the exhibit.

Fiat—The Fiat display consists of two complete cars and two polished chassis. The cars are fitted with landaulet and limousine bodies and are rated at 20 horsepower, using the chassis described as of 15 horsepower in Europe. There are no noteworthy mechanical changes in this type of chassis. The stripped cars are one six-cylinder 38 horsepower and one four-cylinder car of 55 horsepower. A carbureter with throttle and mixing chamber separate and a remodeling of the gate-change mechanism and side-brake gear are features of the larger models.

Isotta Fraschini—Two distinct types are shown in this exhibit. The leader of the line is the giant 120-horsepower chassis. This car has an engine the cylinders of which measure 5.12 by 7.9 inches. A feature of this model is the fact that it has six brakes, two of which are on the front wheels and are operated by emergency lever; two on the jack-shaft, water-cooled, and two on the driving wheels. The other chassis type is rated at 35 horsepower and has front wheel brakes in addition to those installed on the rear wheels. This engine is also of the long-stroke variety, the cylinders measuring 3.94 by 5.5 inches.

Itala—Two artistic limousines are shown as the representatives of this line at the salon. The first is fitted to a chassis rated at 18-24 horsepower and the second on one 25-35 rating. The larger car has a new type of engine which has two rotating vertical valves of skeleton piston shape serving for the inlet and exhaust of the four cylinders. The valves are water-cooled and lubricated by pressure, and rotate at quarter the speed of the engine. The cylinder measurements are 115 by 130 horsepower. A multiple-disk clutch, four-speed transmission, propellor shaft with two universal joints and a bevel drive are among the other features.

Lancia—One polished chassis and one complete car equipped with carbriolet body constitute the Lancia exhibit. The car is nominally of 30 horsepower but its monobloc motor has four cylinders that measure 100 by 130 millimeters and it is said that it develops 50 horsepower on brake test at 1,800 revolutions. The chief difference between the 1912 and 1911 model is that the pump and magneto are operated by the same gearing and the pump is now situated outside the casing. Last year it was enclosed.

Minerva—The full line of models made by the Minerva company, including the 16, 26 and 38-horsepower cars are displayed. The trio is equipped with Knight motors and all are four-cylinder engines, with dual ignition with automatic advance. The two smaller cars are worm-driven while the big car drives from the cardan shaft. The two larger models are built in two wheelbase lengths each, depending on whether a landaulet body is to be used or not. The longer model in the 26-horsepower chassis is 131 inches, while the longer model of the 38 in 134 inches. Two remarkable body types of landaulets are shown.

Mercedes—One complete car, equipped with a 50-horsepower Knight engine and a Kellner body; two stripped chassis, one of 90 horsepower and the other a shaft-driven 50-horsepower car and a cut-out-Knight engine constitute the exhibit of Mercedes cars. The complete car has a sleeve motor with paired cylinders measuring 3 15-16 by 5½ inches. Ignition is by high-tension magneto as against low-tension in the model of corresponding size that is not fitted with the sleeve motor. The wheelbase is 122½ inches. The 50-horsepower chassis shown has a motor 4 23-32 by 6⅞ inches, with low-tension ignition and a coil spring clutch, whereas the Knight car is equipped with a cone clutch. The wheelbase is 135 inches. The big car's motor is 5½ by 6⅞ inches and its wheelbase is 138⅞ inches. It corresponds with the foregoing model save that the drive is by chains instead of shaft and is proportionately larger.

Metallurgique—There are six cars and a stripped chassis on show. The cars are nominally rated at 20, 30, 40 and 60 horsepower and all are equipped with the characteristic radiator that makes their identification so easy. The construction of the Metallurgique seems a trifle lighter this year. Special and stock body designs in variety are displayed, including one inclosed body designed for touring and equipped with a profusion of minor refinements and improvements.

Napier—The Napier exhibit consists first of a 15-horsepower model of four cylinders fitted with a double cabriolet body by Mulliner, fully inclosing the front seat. The top is collapsible and can be converted into an open touring car with a few simple movements, and second, of a 45-horsepower, six-cylinder car, fitted with a seven-passenger torpedo touring body with double windshields to protect both driver and passengers.

Panhard—Six unusual body designs fitted to the regular 30-horsepower Knight-engined Panhard chassis and one stripped chassis of the same type form the exhibit at the Panhard stand. The engine is of four cylinder 100 by 140 millimeters. There have been no radical changes in the construction of the chassis and the only difference to be noted among those exhibited is in the length of wheelbase. In one type the wheelbase is 116 inches and in the other it is 124 inches. But in the bodies shown are some notable differences.

Piccard-Pictet—This make was recently introduced in America and is known by the name of Pic-Pic and is shown in two models. The leader of the line is the 18-22 horsepower car which has four cylinders in pairs, lubrication by pump to the main bearings, water pump, Hele-Shaw clutch and two universal joints, one at each end of the propellor shaft. The 22-30 model has a sleeve-valve motor manufactured under the Argyll patent and similar to the type used by that company.

Renault—The display of Renault cars consists of the following: Double Berlin limousine by Kellner on the regular 30-40 chassis; special limousine by Larboudette, finished in light green silk and mahogany, also on a 30-40 chassis; landaulet-limousine by Muhlbacher on same type of chassis; Kellner limousine in inlaid mahogany; coupe on a 12-16 chassis and three polished chassi showing the mechanical workings of the 35-45, 18-24 and 30-40 models. In addition to the above, a complete 12-16 car, equipped with landaulet body and an 18-24 similarly fitted will be displayed.

S. P. A.—A single example of this type is shown. It is a chasis rated at 16-20 horsepower with four cylinders monobloc. The engine is inclosed with a flush plate and an accelerator pedal take the place of the usual levers on the steering wheel. Forced lubrication by pump through the hollow crankshaft, pump circulation, four speeds wtih direct drive on high and enclosed propellor shaft are other features of this model.

Zedel—Another comparative stranger to American eyes is the Zedel, a car that has attained quite a vogue abroad. At the salon two coupes are displayed. One of the improvements to be noted in this car is the worm in the starting crank which allows the handle to engage wtih the end of the crankshaft without necessitating pushing it into engagement. The float chamber of the carbureter is placed low down while the mixing chamber is located over the cylinder. The car is rated at 14 horsepower, but is said to deevlop over 20.

Motor Specifications of Pleasure Cars Made by American Manufacturers for the Season of 1912

Table No.	NAME OF CAR	CHASSIS MODEL	No. of Cylinders	Bore	Stroke	S. A. E. H. P.	Piston Disp.	Cyl. Type	Cylinders How Cast	Valve Location	COOLING		IGNITION			CARBURETER		Motor Lubrication
											Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed	
1	Abbott-Detroit	30	4	4.13	4.25	27.3	227.2	L-Head	Pairs	Hd. & Side	Pump	Cell	Dual	Splitdorf	Hand	Stromberg	Gravity	Splash
2	Abbott-Detroit	44	4	4.50	5.50	32.4	349.9	"	"	"	"	"	"	"	"	"	"	"
3	Adams-Farwell*	9	5	5.50	5.00	60.5	594.0	I-Type	Separate	Head	Air	.....	"	"	"	Own	"	Forced
4	Alco	40	4	5.25	5.50	44.1	312.0	T-Head	Pairs	Opposite	Pump	Cell	"	Bosch	"	Newcomb	Pressure	"
5	Alco	60	6	4.75	5.50	54.1	585.1	"	"	"	"	"	"	"	"	"	"	"
6	Alpena	30	4	4.00	4.00	25.6	201.1	L-Head	Separate	Lt. Side	"	Tube	"	Remy	"	Schebler	Gravity	Splash
7	Alpena	40	4	4.13	5.25	27.3	280.6	"	"	"	"	"	"	Splitdorf	"	"	"	"
8	American	20	4	3.75	4.50	22.5	198.8	"	En Bloc	Rt. Side	"	Cell	Single	Bosch	"	"	"	"
9	American	30	4	4.50	5.00	32.4	318.1	T-Head	"	Opposite	"	"	Dual	"	"	Rayfield	Pressure	"
10	American	Traveler	4	5.38	5.50	46.0	499.2	L-Head	Pairs	Rt. Side	"	"	"	"	"	"	"	Forced
11	American	Trav. Spec.	4	5.38	5.50	46.0	499.2	"	"	"	"	"	"	"	"	"	"	"
12	Ames	42	4	4.13	5.25	27.3	280.6	"	En Bloc	Lt. Side	Thermal	"	"	Splitdorf	"	Schebler	Gravity	Splash
13	Anna	..	2	5.25	4.00	22.0	173.2	"	Separate	Side	"	Tube	Single	Bosch	Fixed	"	"	"
14	Apperson	4-45	4	4.50	5.00	32.4	318.1	T-Head	"	Opposite	Pump	Cell	Dual	Eisemann	Hand	Rayfield	"	"
15	Apperson	4-55	4	4.75	5.00	36.1	354.4	"	"	"	"	"	"	"	"	"	"	"
16	Apperson	4-65	4	5.50	5.00	48.4	475.2	"	"	"	"	Tube	"	Bosch	"	Own	"	Forced
17	Arbenz	40	4	4.13	5.25	27.3	280.6	L-Head	Pairs	Side	"	"	Double	.....	"	Schebler	"	Splash
18	Atlas	0	4	4.50	4.50	.....	286.3	2-Cycle	"	.....	"	Cell	"	.....	"	Own	"	In Fuel
19	Auburn	30-L	4	4.00	4.00	25.6	201.1	L-Head	Separate	Lt. Side	"	Tube	Dual	Remy	"	Schebler	"	Splash
20	Auburn	35-L	4	4.13	5.25	27.3	280.6	"	"	"	"	"	"	"	"	"	"	"
21	Auburn	40-N	4	4.50	5.00	32.3	318.1	"	"	"	"	"	"	"	"	"	"	"
22	Auburn	6-50	6	4.13	5.25	40.9	420.9	"	"	"	"	"	Double	Bosch	"	"	"	"
23	Austin	45	6	4.38	5.25	45.9	473.7	"	Pairs	Side	"	"	"	Splitdorf	"	Carter	"	"
24	Austin	50	6	4.50	6.00	48.6	588.6	T-Head	Separate	Opposite	"	"	"	"	"	"	"	"
25	Austin	77	6	4.50	7.00	48.6	667.9	"	"	"	"	"	"	Optional	"	"	"	"
26	Autocar	24-B	4	4.38	4.50	30.6	270.6	L-Head	Pairs	Hd. & Side	"	"	"	Bosch	"	Stromberg	Pressure	Forced
27	Babcock	H	4	4.13	5.25	27.3	280.6	"	"	Lt. Side	"	Cell	Dual	"	"	Rayfield	Gravity	Splash
28	Babcock	F	4	4.50	5.00	32.4	318.1	"	"	Rt. Side	"	"	"	"	"	Stromberg	"	"
29	Babcock	K	4	4.75	5.50	36.1	389.9	T-Head	"	Opposite	"	"	"	.....	"	Rayfield	"	"
30	Bergdoll	C	4	4.00	4.50	25.6	226.2	L-Head	En Bloc	Hd. & Side	"	"	Single	Bosch	"	Mayer	Optional	"
31	Bergdoll	D	4	4.00	5.93	25.6	266.2	"	"	"	"	"	"	"	"	"	"	"
32	Berkshire	E	4	4.69	5.50	39.0	379.6	T-Head	Separate	Opposite	"	"	Dual	"	"	Schebler	Gravity	Forced
33	Berkshire	F	6	4.69	5.50	58.5	569.4	"	"	"	"	"	"	"	"	.....	"	Splash
34	Brush	1912	1	4.00	5.00	6.4	62.8	L-Head	"	Side	Thermal	Tube	Single	.....	"	Kingston	"	"
35	Buick	34	4	3.75	3.75	22.5	165.6	I-Type	Pairs	Head	Pump	"	Dual	Splitdorf	"	Schebler	"	"
36	Buick	35	4	3.75	3.75	22.5	165.6	"	"	"	"	"	"	"	"	"	"	"
37	Buick	28 & 29	4	4.00	4.00	25.6	201.1	"	"	"	"	"	"	"	"	"	"	"
38	Buick	43	4	4.50	5.00	32.4	318.1	"	"	"	"	"	"	"	"	"	"	"
39	Cadillac	1912	4	4.50	4.50	32.4	286.3	L-Head	Separate	Rt. Side	"	"	Double	†	"	Own	"	"
40	Cameron	28	4	3.88	3.75	24.0	176.9	I-Type	"	Head	Air	.....	Optional	.....	"	.....	"	"
41	Cameron	29	4	3.88	3.75	24.0	176.9	"	"	"	"	.....	"	"	"	.....	"	"
42	Cameron	30	6	3.88	3.75	36.1	265.4	"	"	"	"	.....	"	"	"	.....	"	"
43	Cameron	32	6	3.88	3.75	36.1	265.4	"	"	"	"	.....	"	"	"	.....	"	"
44	Carhartt	J	4	4.09	4.50	26.4	233.3	L-Head	En Bloc	Side	Pump	Cell	Double	Splitdorf	"	Stromberg	"	"
45	Carhartt	B	4	4.88	5.50	38.0	410.6	T-Head	Pairs	Opposite	"	"	Dual	Bosch	"	"	"	"
46	Cartercar	H	4	4.00	4.00	25.6	201.1	L-Head	"	Lt. Side	"	Tube	"	Splitdorf	"	Schebler	"	"
47	Cartercar	R	4	4.13	4.75	27.3	253.9	"	"	"	"	"	"	"	"	"	"	"
48	Cartercar	S	4	4.50	5.25	32.4	334.0	"	"	"	"	"	"	"	"	"	"	"
49	Case	30	4	4.25	5.00	28.9	283.6	T-Head	"	Opposite	"	Cell	Single	Remy	"	Optional	"	"
50	Case	40	4	4.50	5.25	32.4	334.0	"	"	"	"	"	"	"	"	"	"	"
51	Chadwick	19	6	5.00	6.00	60.0	706.8	L-Head	"	Hd.&Side	"	"	Double	Bosch	"	Own	Pressure	Forced
52	Chadwick	19	6	5.00	6.00	60.0	706.8	"	"	"	"	"	"	"	"	"	"	"
53	Chalmers	30	4	4.00	4.50	25.6	226.2	"	En Bloc	"	"	"	Dual	Splitdorf	"	Mayer	Optional	Splash
54	Chalmers	36	4	4.25	5.25	28.9	297.8	"	"	"	"	"	"	Bosch	"	Rayfield	Pressure	"
55	Chalmers	12	6	4.25	5.25	43.8	446.7	"	Threes	"	"	"	"	Mea	"	"	"	"
56	Cino	4	4	4.38	5.00	30.6	300.7	T-Head	Pairs	Opposite	"	"	"	Bosch	"	Stromberg	Gravity	"
57	Cino	6	6	4.00	5.00	38.4	396.9	"	Threes	"	"	"	"	"	"	"	"	"
58	Clark	E	4	4.13	5.25	27.3	280.6	L-Head	Pairs	Lt. Side	"	"	"	Remy	"	Optional	"	"
59	Clark	G	4	4.13	5.25	27.3	280.6	"	"	"	"	"	"	"	"	"	"	"
60	Clark	T	4	4.09	4.50	26.4	233.3	"	En Bloc	Side	"	"	"	"	"	"	"	"
61	Coey	1912	6	4.00	5.00	38.4	377.0	T-Head	Threes	Opposite	"	"	"	Bosch	"	Schebler	Pressure	"
62	Colby	L	4	4.09	4.50	26.4	233.3	L-Head	En Bloc	Rt. Side	"	Tube	"	Splitdorf	"	Stromberg	Gravity	"
63	Colby	H	4	4.13	5.25	27.3	280.6	"	Pairs	Lt. Side	"	"	"	Eisemann	"	"	"	"
64	Colby	J	4	4.25	5.25	28.9	297.8	"	"	Side	"	"	Double	Remy	"	Rayfield	"	"

Note—*Adams-Farwell, revolving cylinder motor. †Cadillac has Delco combined ignition, lighting and starting system. Abbreviations: Thermal, thermo-syphon water circulation; Tube., tubular radiator; Cell cellular or honeycomb radiator.
Bore and stroke are given in decimals to the nearest 1-100th inch: as, 4.50=4½, etc., .06=1-16, .13=⅛, .19=3-16, .25=¼, .31=5-16, .38=⅜, .44=7-16, .50=½, .56=9-16, .63=⅝, .69=11-16, .75=¾, .81=13-16, .88=⅞ .94=15-16, 1=1.00.

Transmission and Running Gear Specifications of American Pleasure Cars for the 1912 Season

.94=15-16, 1=1.06.

Transmission and Running Gear Specifications of American Pleasure Cars for the 1912 Season

Table No.	NAME OF CAR	CHASSIS MODEL	RUNNING GEAR								TRANSMISSION						BRAKES		BEARINGS					
			Wheel-base	Front Tires	Rear Tires	Front Springs	Rear Springs	Front Axle	CLUTCH		GEARSET			Drive	Car Drives Thru	Rear Axle	Service	Em.	Crankshaft		Gearset	Front Wheel	Rear Axle	Str'ng Knu'le	Str'ng Gear
									Type	Friction Surface	Type	No. Spds	Loc.						Type	No.					
1	Abbott-Detroit	30	110	34x3½	34x3½	½ El	¾ El	I B	M D	....	Sel	3	Amid	Shaft	T&RR	Floating	Ext	Int	Plain	3	Ball	Roller	Roller	Plain	Plain
2	Abbott-Detroit	44	120	36x4	36x4	"	"	"	"	S & R	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
3	Adams-Farwell	9	128	36x4½	36x4½	"	½ El	R'nd	Cone	Leath	"	3	U M	Chain	Springs	Semi-F	Int	Ext	"	3	"	"	"	"	B&Pl
4	Alco	40	126	36x4	36x5	"	"	I B	M D	S & B	"	4	Amid	Shaft	R R	Float	Ext	Int	"	3	"	Ball	Ball	....	Plain
5	Alco	60	134	36x4	36x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	4	"	"	"	....	"
6	Alpena	30	112	34x3½	34x3½	"	Plat	"	Cone	Leath	"	3	R A	"	T T	Semi-F	"	"	"	5	Plain	"	Roller	Plain	Ball
7	Alpena	40	120	36x4	36x4	"	¾ El	"	M D	S & R	"	3	U M	"	"	Float	Int	"	"	5	"	"	"	"	"
8	American	20	105	36x3½	36x3½	"	½ El	"	Cone	I & L	"	3	"	"	"	"	"	"	"	2	Ball	"	Ball	Ball	"
9	American	30	118	37x4	37x4	"	"	"	"	Ther	"	3	Amid	"	"	"	"	"	"	3	"	"	"	"	"
10	American	Traveler	124	40x4	41x4½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	B & Pl	B & P
11	American	Traveler Spec	140	41x4½	41x4½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
12	Ames	42	116	36x4	36x4	"	¾ El	"	M D	Steel	"	3	U M	"	Springs	"	"	"	"	3	"	"	B & R	Plain	Ball
13	Anna	.....	100	34x3½	34x3½	"	El	"	"	S & F	Plan	2	Amid	Chain	R R	Dead	Trans	Ext	"	2	....	Roller	Roller	Roller	"
14	Apperson	4-45	114	34x4	34x5	"	¾ El	"	Con	S & B	Sel	3	R A	Shaft	T T	Semi-F	Ext	Int	"	5	Ball	Ball	B & R	Ball	"
15	Apperson	4-55	118	36x4	36x4½	"	"	"	"	"	"	3	Amid	"	Springs	"	"	"	"	5	Roller	"	Roller	"	"
16	Apperson	4-65	129	36x4½	37x5	"	½ El	"	"	"	"	4	"	"	"	"	"	"	"	5	B & Pl	Roller	B & R	"	"
17	Arbens	40	120	36x4	36x4	"	¾ El	"	Cone	....	"	3	R A	"	R R	Float	....	....	"	3	Ball	Ball	Roller	....	Plain
18	Atlas	O	128	36x4½	36x4½	"	"	"	M D	Ray	"	3	U M	"	Springs	"	Ext	Int	Roller	5	Roller	Roller	"	Plain	Ball
19	Auburn	30-L	112	34x3½	34x3½	"	½ El	"	Cone	L & S	"	3	Amid	"	R R	Semi-F	"	"	Plain	5	Ball	Ball	....	"	Plain
20	Auburn	35-L	116	34x3½	34x3½	"	"	"	"	L & I	"	3	"	"	"	Float	"	"	"	5	"	"	Ball	"	"
21	Auburn	40-M	120	36x4	36x4	"	"	"	"	"	"	3	"	"	"	"	Int	"	"	5	"	"	"	"	"
22	Auburn	6-50	135	37x4½	37x4½	"	"	"	M D	T & S	"	3	"	"	"	"	"	Int	"	7	"	"	"	"	"
23	Austin	45	126	36x4½	36x4½	"	El	"	"	Steel	"	3	"	"	"	"	Ext	"	"	4	"	"	"	"	"
24	Austin	50	135	36x4½	36x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	7	"	"	"	"	"
25	Austin	77	141	37x5	37x5	"	¾ El	"	"	"	"	4	"	"	....	"	"	"	"	7	"	"	"	"	"
26	Autocar	24-B	117	37x4½	37x4½	"	Plat	"	"	S & I	"	3	"	"	T T	"	Ext	"	"	3	Roller	Roller	Roller	"	"
27	Babcock	H	114	34x4	34x4	"	¾ El	"	"	S & B	"	3	"	"	Springs	"	Int	"	"	3	"	Ball	Ball	Ball	Ball
28	Babcock	F	120	36x4½	36x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"	"
29	Babcock	K	120	36x4½	36x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"	Plain
30	Bergdoll	C	115	34x3½	34x3½	"	"	"	"	S & T	"	3	U M	"	"	"	Ext	Ext	Ball	2	Ball	"	Ball	B & Pl	B & Pl
31	Bergdoll	D	115	36x4	36x4	"	"	"	"	"	"	4	"	"	"	"	"	"	"	2	"	"	"	"	"
32	Berkshire	E	124	36x4	36x4½	"	"	"	"	Steel	"	3	Amid	"	T&RR	"	"	Int	Plain	5	"	"	"	Plain	Plain
33	Berkshire	F	134	37x5	37x5	"	"	"	"	"	"	4	"	"	"	"	"	....	"	7	"	"	"	"	"
34	Brush	1912	80	28x3	28x3	Coil	Coil	Wood	"	S & B	Plan	2	"	Chain	R R	Dead	Int	....	"	2	B & Pl	"	"	"	"
35	Buick	34	91	32x3½	32x3½	½El	El	Tube	"	"	"	3	"	Shaft	"	Semi-F	Ext	Int	"	3	"	"	B & R	"	"
36	Buick	35	102	32x3½	32x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
37	Buick	28-29	108	34x3½	34x3½	"	½ El	I B	Cone	L & I	Sel	3	"	"	"	"	"	"	"	3	"	"	"	"	"
38	Buick	43	116	36x4	36x4	"	"	"	"	"	"	3	"	"	"	Float	"	"	"	3	"	"	"	"	"
39	Cadillac	1912	116	36x4	36x4	"	Plat	"	"	L & S	"	3	"	"	T T	"	"	"	"	5	Ball	Roller	Roller	"	B & Pl
40	Cameron	28	104	32x3	32x3	"	El	Tube	"	Leath	"	3	R A	"	"	"	"	"	"	3	"	Ball	Ball	"	Plain
41	Cameron	29	110	32x3½	32x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
42	Cameron	30	114	34x3½	34x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	4	"	"	"	"	"
43	Cameron	32	120	34x3½	34x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	4	"	"	"	"	"
44	Carhartt	J	108	34x3½	34x3½	"	¾ El	I B	"	....	"	3	Amid	"	"	Semi-F	....	....	"	3	Roller	"	"	"	"
45	Carhartt	B	118	34x4	34x4	"	"	"	"	....	"	3	"	"	Springs	Float	Int	Ext	"	3	"	Roller	Roller	"	"
46	Cartercar	H	102	32x3½	32x3½	"	½ El	"	....	....	Frict	....	"	Chain	R R	"	"	....	"	3	Ball	Ball	"	"	Ball
47	Cartercar	R	112	36x4	36x4	"	¾ El	"	....	....	"	....	"	"	"	"	Ext	Int	"	3	"	"	"	"	"
48	Cartercar	S	122	36x4½	36x4½	"	"	"	....	....	"	....	"	"	"	"	"	"	"	3	"	"	"	"	"
49	Case	30	116	34x4	34x4	"	"	"	M D	Steel	Sel	3	"	Shaft	"	Semi-F	Int	Ext	"	3	....	"	Plain	....	.....
50	Case	40	120	36x4	36x4	"	"	"	"	"	"	3	"	"	"	Float	"	"	"	3	....	....	"	....	....
51	Chadwick	19	112	36x4½	36x4½	"	½ El	"	Exp.	L & I	"	4	"	Chain	"	Dead	Trans	Int	"	4	Ball	Ball	Ball	B & Pl	B & Pl
52	Chadwick	19	133	36x4½	37x3½	"	Plat	"	"	"	"	4	"	"	"	"	"	"	"	4	"	"	"	"	"	"
53	Chalmers	30	115	34x3½	34x3½	"	½ El	"	M D	S & B	"	3	U M	Shaft	T R	Float	"	"	Ball	2	"	"	"	Plain	Plain
54	Chalmers	36	115	36x3½	36x3½	"	"	"	"	"	"	4	"	"	"	"	Ext	"	"	2	"	Roller	Roller	"	"
55	Chalmers	12	130	36x4½	36x4½	"	"	"	"	Steel	"	4	"	"	"	"	"	"	"	3	Roller	"	"	"	B & Pl
56	Cino	4	116	34x4	34x4	"	"	"	Cone	Leath	"	3	Amid	"	"	"	Int	Ext	Plain	3	Ball	Ball	Ball	....	....
57	Cino	6	130	36x4	36x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	....	....
58	Clark	E	116	34x3½	34x3½	"	El	"	"	"	"	3	R A	"	T T	Semi-F	....	....	"	3	....	....	....	....	....
59	Clark	G	120	34x3½	34x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	....	....	Roller	....	....
60	Clark	T	114	34x3½	34x3½	"	"	"	"	"	"	3	"	"	"	"	....	....	"	3	....	....	"	....	....
1	Coey	1912	124	36x4	36x4	"	¾ El	"	M D	S & B	"	3	"	"	"	"	Int	....	"	3	....	Ball	Ball	Ball	Ball
62	Colby	L	116	36x4	36x4	"	½ El	"	Cone	L & I	"	3	"	"	TT&RR	"	Ext	Int	"	2	Roller	"	Roller	Plain	"
63	Colby	H	121	36x4	36x4	"	½ El	Box	M D	Steel	"	3	Amid	"	"	Float	....	....	Plain	3	Ball	"	Ball	"	"
64	Colby	J	112	32x4	32x4	"	½ El	I B	Cone	Ray	"	3	"	"	....	....	Int	Int	"	3	"	"	"	Ball	"

Note—Abbreviations: Clutch: M. D., multiple disk; Con., contracting band; Exp., expanding band. Friction surface: Lin., linobestos; Ther., thermoid; A., asbestos; F., fiber; B., bronze; Leath., leather; S., steel. Gearset location: Amid., amidship; U. M., in unit with the motor; R. A., on the rear axle. Drive: Worm, shaft with worm gear. Car drives through: T. T., torsion tube; R. R., radius rod; T. R., torsion rods; S., springs. Brakes: Int., internal expanding on rear hubs; Ext., external contracting on rear hubs; Trans., on transmission. Springs: El., elliptic. Front Axle: I. B., I-beam; Chan., channel.

Motor Specifications of Pleasure Cars Made by American Manufacturers for the Season of 1912

Table No.	NAME OF CAR	CHASSIS MODEL	No. of Cylinders	Bore	Stroke	S. A. E. H P.	Piston Disp.	Cyl. Type	Cylinders How Cast	Valve Location	COOLING		IGNITION			CARBURETER		Motor Lubrication
											Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed	
65	Cole	1912	4	4.50	5.25	32.4	334.0	L-Head	Pairs	Lt. Side	Pump	Cell	Dual	Bosch	Hand	Schebler	Gravity	Splash
66	Columbia	Cavalier	4	4.88	5.50	38.0	410.6	T-Head	"	Opposite	"	"	Double	"	"	Stromberg	Pressure	"
67	Columbia	Knight	4	4.88	5.13	38.0	382.6	Sleeve	"	In Sleeve	"	"	"	"	"	"	"	Forced
68	Corbitt	.....	4	4.00	4.50	25.6	226.2	L-Head	"	Rt. Side	"	"	Dual	Splitdorf	"	Planhard	Gravity	"
69	Corbin	30	4	4.50	4.25	32.4	270.4	"	Separate	Lt. Side	"	"	Double	U & H	"	Schebler	"	"
70	Corbin	40	4	4.75	5.50	36.1	389.9	T-Head	Pairs	Opposite	"	"	"	"	"	Stromberg	"	"
71	Correja	A-B-C	4	4.25	5.00	28.9	283.6	"	"	"	"	"	Single	Simms	Fixed	Schebler	"	"
72	Correja	T-R-S	4	4.25	5.00	28.9	283.6	"	"	"	"	"	"	"	"	"	Pressure	"
73	Courier	1912	4	3.75	5.13	22.5	226.4	L-Head	En Bloc	Lt. Side	Thermal	Tube	"	.....	Hand	Stromberg	Gravity	Splash
74	Crawford	12-30	4	4.13	4.75	27.3	253.9	"	"	"	Pump	"	Dual	Remy	"	"	"	"
75	Crawford	12-35	4	4.50	4.50	32.4	286.3	"	Pairs	"	"	"	"	"	"	"	"	"
76	Crawford	12-40	4	4.50	5.50	32.4	349.9	"	"	Rt. Side	"	"	"	Bosch	"	"	"	"
77	Crow-Elkhart	50	4	3.75	4.50	22.5	198.8	"	En Bloc	"	Thermal	"	"	Briggs	"	Schebler	"	"
78	Crow-Elkhart	52	4	4.00	4.50	25.6	226.2	"	"	"	"	"	Single	"	"	"	"	"
79	Crow-Elkhart	55	4	4.13	4.75	27.3	253.9	"	Pairs	"	"	"	Dual	"	"	"	"	"
80	Crow-Elkhart	56	4	4.38	5.00	30.6	300.7	"	"	Lt. Side	"	"	Single	"	"	"	"	"
81	Crow-Elkhart	58	4	4.50	5.00	32.4	318.1	"	"	"	"	"	Dual	"	"	"	"	"
82	Cunningham	J	4	4.75	5.75	36.1	407.6	I-Type	"	Head	"	"	"	Bosch	"	Stromberg	"	"
83	Cutting	A-30	4	4.00	5.00	25.6	251.3	L-Head	En Bloc	Lt. Side	"	Cell	Double	Remy	"	Chapin	"	Forced
84	Cutting	T-55	4	4.75	5.50	36.1	289.9	T-Head	Pairs	Opposite	Pump	"	"	"	"	"	Pressure	"
85	Dalton	6	4	3.63	4.25	20.3	175.5	L-Head	"	Lt. Side	Thermal	Tube	Single	Bosh	"	Optional	Gravity	Splash
86	Davis	40	4	4.13	5.25	27.3	280.6	"	En Bloc	"	Pump	"	Dual	"	"	Schebler	"	"
87	Day Utility	B	4	4.00	4.50	25.6	226.2	"	Pairs	Side	"	"	Double	"	"	"	"	"
88	De Tamble	K-L-M	4	4.25	5.00	28.9	283.6	"	"	Lt. Side	"	Cell	Dual	Michigan	"	"	"	"
89	Dispatch	E	2	3.50	5.00	.....	96.2	2-Cycle	Separate	.....	Air	.....	Single	Simms	"	"	"	In Fuel
90	Dispatch	G-2	4	3.50	5.00	.....	192.4	"	"	.....	"	.....	"	"	"	"	"	"
91	Dorris	G	4	4.38	5.00	30.6	300.7	L-Head	Pairs	Head	Pump	Cell	Dual	Bosch	"	Stromberg	"	Splash
92	Duryea	Electa	2	3.75	3.75	.....	82.8	2-Cycle	Separate	.....	Air	.....	Single	.....	"	Heitger	"	In Fuel
93	Duryea	Buggy type	2	3.75	3.75	.....	82.8	"	"	.....	"	.....	"	.....	"	"	"	"
94	Duryea	Runabout	2	3.75	3.75	.....	82.8	"	"	.....	"	.....	"	.....	"	"	"	"
95	Elmore	R-26	4	4.00	3.50	.....	175.9	"	"	.....	Thermal	Tube	Dual	K-W	"	Schebler	"	Splash
96	Elmore	R-27	4	4.00	3.50	.....	175.9	"	"	.....	"	"	"	"	"	"	"	"
97	Elmore	37	4	4.50	4.00	.....	254.5	"	"	.....	"	"	"	"	"	"	"	"
98	E-M-F	A-1912	4	4.00	4.50	25.6	226.2	L-Head	Pairs	Lt. Side	Pump	"	"	Splitdorf	"	Own	"	"
99	Everitt	30	4	4.00	4.75	25.6	238.8	"	En Bloc	"	"	Cell	"	"	"	"	"	"
100	Everitt	4-36	4	4.00	4.75	25.6	238.8	"	"	"	"	"	"	"	"	"	"	"
101	Everitt	6-48	6	4.00	4.75	38.4	358.2	"	"	"	"	"	"	"	"	"	"	"
101-A	Fiat	4	4	4.40	6.00	31.3	357.3	"	"	"	"	"	"	Simms	"	"	Pressure	"
101-B	Fiat	6	6	4.40	6.00	47.0	530.0	"	"	"	"	"	"	"	"	"	"	"
102	Firestone-Columbus	86-D	4	4.13	4.25	27.3	280.6	"	"	Lt. Side	"	Tube	"	Mea	"	Schebler	Gravity	"
103	Firestone-Columbus	60-D	4	4.50	5.00	32.4	318.1	"	Pairs	Rt. Side	"	"	Double	"	"	"	"	"
104	Firestone-Columbus	68-D	4	4.50	5.50	32.4	249.9	"	"	Lt. Side	"	"	"	"	"	"	"	"
105	Flanders	S	4	3.62	3.75	20.3	154.8	"	En Bloc	"	"	"	Dual	Splitdorf	"	Own	"	"
106	Flanders	S	4	3.62	3.75	20.3	154.8	"	"	"	"	"	"	"	"	"	"	"
107	Ford	T	4	3.75	4.00	22.5	176.7	"	"	Rt. Side	Thermal	"	Single	Own	"	Optional	"	"
108	*Four Wheel Drive	A	4	4.75	5.50	36.1	289.9	T-Head	Pairs	Opposite	Pump	Cell	Dual	Bosch	"	"	"	Forced
109	Franklin	G-Runabout	4	3.38	4.00	18.3	143.1	I-Type	Separate	Head	Air	.....	"	"	Fixed	Own	"	"
110	Franklin	G-Touring	4	4.00	4.00	25.6	201.1	"	"	"	"	.....	"	"	Governor	"	"	"
111	Franklin	25	4	4.00	4.00	25.6	201.1	"	"	"	"	.....	"	"	"	"	"	"
112	Franklin	M	6	3.62	4.00	31.6	247.6	"	"	"	"	.....	"	"	"	"	"	"
113	Franklin	D	6	4.00	4.00	38.4	301.6	"	"	"	"	.....	"	"	"	"	"	"
114	Franklin	H	6	4.00	4.00	38.4	301.6	"	"	"	"	.....	"	"	"	"	"	"
115	Frontenac	E	4	4.75	5.00	36.1	354.4	L-Head	Pairs	Rt. Side	Pump	Cell	"	Splitdorf	Hand	Stromberg	"	Splash
116	Garford	G-12	4	4.25	5.25	28.9	297.8	"	En Bloc	Lt. Side	"	"	"	Bosch	"	Own	"	"
117	Garford	G-8	4	4.75	5.25	36.1	372.1	T-Head	Pairs	Opposite	"	"	"	"	"	"	"	"
118	Garford	G-14	6	4.25	5.25	43.8	446.7	L-Head	Threes	Lt. Side	"	"	Double	"	"	"	"	"
119	G. J. G	Junior	4	3.75	4.50	22.5	198.8	"	Pairs	"	"	"	Dual	"	"	Schebler	"	"
120	G. J. G	Senior	4	4.75	5.00	36.1	354.4	"	"	"	"	"	"	"	"	"	Optional	"
121	Glide	.....	4	4.75	5.00	36.1	354.4	"	Separate	Rt. Side	"	"	"	Eisemann	"	"	Gravity	"
122	Great Eagle	4-50	4	4.75	5.00	36.1	354.4	"	"	Lt. Side	"	"	"	Remy	.....	Stromberg	.....	.....
123	Great Eagle	6-60	6	4.13	5.25	40.9	420.9	"	"	"	"	"	"	"	Hand	"	Gravity	.....
124	Great Southern	30	4	4.00	4.50	25.6	226.2	"	En Bloc	Rt. Side	Thermal	"	"	Bosch	"	Schebler	"	Splash
125	Great Southern	50	4	5.13	6.00	42.0	495.1	"	Pairs	"	Pump	"	Double	"	"	Stromberg	"	"
126	Great Western	40	4	4.25	5.00	28.9	283.6	"	Separate	Hd.&Side	"	Tube	Dual	Remy	"	Schebler	"	"

Note—*Four-Wheel Drive drives on both front and rear wheels. Abbreviations: Thermal, thermo-syphon circulation; Tube., tubular radiator; Cell., cellular or honeycomb radiator. Bore and stroke are given in decimals to the nearest 1-100th inch: as, 4.50=4½, etc., .06=1-16, .13=⅛, .19=3-16, .25=¼, .31=5-16, .38=⅜, .44=7-16, .50=½, .56=9-16, .63=⅝, .69=11-16, .75=¾, .81=13-16, .88=⅞, .94=15-16, 1=1.00.

Transmission and Running Gear Specifications of American Pleasure Cars for the 1912 S

Bore and stroke are given in decimals to the nearest .04=15-16, 1=1.00.

Transmission and Running Gear Specifications of American Pleasure Cars for the 1912 Season

Table No.	NAME OF CAR	CHASSIS MODEL	RUNNING GEAR								TRANSMISSION						BRAKES		BEARINGS					
									CLUTCH		GEARSET								Crankshaft					
			Wheelbase	Front Tires	Rear Tires	Front Springs	Rear Springs	Front Axle	Type	Friction Surface	Type	No. Spds	Loc.	Drive	Car Drives Thru	Rear Axle	Service	Em.	Type	No.	Gear set	Front Wheel	Rear Axle	Str'ng Knu'le	Str'ng Gear
65	Cole	1912	122	36x4	36x4	½ El	½ El	I B	Cone	L & S	Sel	3	U M	Shaft	Springs	Float	Ext	Int	Plain	3	Ball	Roller	Roller	Plain	Ball
66	Columbia	Cavalier	120	36x4	36x4	"	"	"	"	L & I	"	3	Amid	"	"	"	"	"	"	3	"	"	"	"	B & Pl
67	Columbia	Knight	129	36x4½	36x4½	"	"	"	"	"	"	4	"	"	R R	"	"	"	"	5	"	"	"	B & Pl	Roller
68	Corbitt	.....	120	34x4	34x4	"	¾ El	"	M D	Steel	"	3	U M	"	TT&S	Semi-F	"	"	"	3	"	Ball	B & R	Plain	Ball
69	Corbin	30	115	34x4	34x4	"	"	"	Cone	L & I	"	3	Amid	"	Springs	"	Int	Ext	B & Pl	5	"	"	Ball	Ball	Plain
70	Corbin	40	120	36x4	36x4	"	"	"	"	"	"	3	"	"	"	Float	"	"	Plain	3	"	"	"	"	"
71	Correja	A-B-C	105	34x3½	34x3½	"	"	"	"	L & S	"	3	R A	"	TT&TR	Semi-F	Ext	"	"	3	Roller	Roller	Roller	Plain	.....
72	Correja	T-R-S	125	36x4	36x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	Plain
73	Courier	1912	108	28x3½	28x3½	"	½ El	"	M D	S & B	"	3	Amid	"	Springs	Floating	"	Int	Ball	2	Ball	Ball	Ball	"	B & Pl
74	Crawford	12-30	115	34x3½	34x4	"	El	"	Cone	Leath	"	3	R A	"	T T	"	"	"	Plain	3	B & R	"	Roller	"	Plain
75	Crawford	12-35	120	34x4	34x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
76	Crawford	12-40	123	34x4	34x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	Roller	"	"	"	"
77	Crow-Elkhart	50	110	32x3	32x3	"	"	"	M D	Steel	"	3	"	"	"	Semi-F	"	"	"	2	"	"	"	"	"
78	Crow-Elkhart	52	113	32x3½	32x3½	"	"	"	"	"	"	3	"	"	R R	"	"	"	"	3	"	"	"	"	"
79	Crow-Elkhart	55	116	34x3½	34x3½	"	"	"	"	"	"	3	"	"	TT&RR	"	"	"	"	3	B & R	"	B&R	"	"
80	Crow-Elkhart	56	122	37x4½	37x4½	"	¾ El	"	"	"	"	3	"	"	R R	Float	"	"	"	3	Roller	"	Ball	"	"
81	Crow-Elkhart	58	122	36x4	36x4	"	"	"	"	"	"	3	"	"	"	"	Int	Ext	"	3	B & R	"	B & R	"	"
82	Cunningham	J	124	..x4½	..x4½	"	½ El	"	Cone	L & C	"	3	U M	"	Springs	"	Ext	Int	"	3	Ball	Roller	Roller	"	Ball
83	Cutting	A-30	116	34x4	34x4	"	¾ El	"	M D	Iron	"	3	Amid	"	R R	Semi-F	"	"	"	3	Plain	Ball	"	"	Plain
84	Cutting	T-55	116	36x4	36x4	"	"	"	"	"	"	3	"	"	TT&RR	Float	"	"	"	3	Roller	"	B & R	"	"
85	Dalton	6	106	32x3½	32x3½	"	"	"	Cone	L & I	"	3	R A	"	Springs	Semi-F	Int	"	"	3	"	"	Roller	"	"
86	Davis	40	112	36x4	36x4	.....	¾ Plat	"	"	Leath	"	3	Amid	"	R R	Float	.....	.....	"	3	.....	"	B & R	"	"
87	Day Utility	B	110	32x3½	32x3½	½ El	¾ El	"	M D	S& B	"	3	U M	"	Springs	Semi-F	I & E	I & E	"	3	Plain	"	Roller	Ball	Ball
*88	DeTamble	K-L-M	116	34x4	34x4	"	¾ El	"	"	"	"	3	"	"	TT&S	Float	Ext	Int	"	3	Ball	"	B & R	Plain	"
89	Dispatch	E	96	36x3	36x3	El	El	Tube	....	.....	Frict.	....	Amid	Chain	RR&S	Dead	Int	....	"	3	Roller	Roller	Roller	"	"
90	Dispatch	G	120	36x3½	36x3½	"	"	"	....	.....	"	....	"	"	"	"	"	....	"	3	"	"	"	"	"
91	Dorris	G	115	36x4	36x4	½ El	Plat	I B	M D	S & R	Sel	3	U M	Shaft	Springs	Float	"	Ext	"	3	"	"	"	"	"
92	Duryea	Electa	80	34x1½	40x1½	½ El	½ El	Chan	....	.....	Frict.	2	R A	Roller	T R	Dead	Ext	....	"	4	"	Ball	Ball	"	Plain
93	Duryea	Buggy type	84	38x1½	42x1½	"	"	"	....	.....	"	2	"	"	"	"	"	.....	"	4	"	"	"	"	"
94	Duryea	Runabout	100	30x3	36x3	"	"	"	.....	.....	"	2	"	"	"	"	"	.....	"	4	"	"	"	"	"
95	Elmore	R-26	108½	32x3½	32x3½	½ El	El	I B	Exp	F & S	Sel	3	Amid	Shaft	T T	Semi-F	"	Int	"	6	B & P	"	Roller	"	"
96	Elmore	R-27	108½	32x3½	32x3½	"	¾ El	"	"	"	"	3	"	"	"	"	"	"	"	6	"	"	"	"	"
97	Elmore	37	114	34x4	34x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	6	"	"	"	"	"
98	E-M-F	A-1912	112	32x3½	32x3½	"	El	"	Cone	L & I	"	3	R A	"	"	"	"	"	"	3	Roller	"	"	"	"
99	Everitt	30	110	34x3½	34x3½	"	"	"	"	L & S	"	3	"	"	"	"	.....	.....	"	3	P & R	"	"	"	"
100	Everitt	4-36	115	34x4	34x4	"	"	"	"	"	"	3	"	"	"	"	.....	.....	"	3	"	"	"	"	"
101	Everitt	6-48	127	36x4	36x4	"	"	"	"	"	"	3	"	"	"	"	.....	.....	"	3	"	"	"	"	"
101-A	Fiat	4	123	36x4½	36x4½	"	¾ El	"	M D	Steel	"	4	Amid	"	....	"	Trans	Int	"	..	Ball	"	Ball	Ball	Ball
101-B	Fiat	6	135	36x4½	37x5	"	"	"	"	"	"	4	"	"	"	"	Int	Ext	"	..	"	"	"	"	"
102	Firestone-Columbus	86-D	116	34x4	34x4	"	"	"	Cone	F & I	"	3	"	"	RR&S	Float	"	Int	"	3	"	"	"	"	"
103	Firestone-Columbus	60-D	121	36x4	36x4	"	"	"	"	"	"	3	"	"	T T	"	Ext	"	"	3	"	"	"	"	"
104	Firestone-Columbus	68-D	121	36x4½	36x4½	"	"	"	"	"	"	3	"	"	RR&S	"	Int	"	"	3	"	"	"	"	"
105	Flanders	S	102	30x3	30x3½	"	El	"	"	Leath	"	3	R A	"	T T	Semi-F	Ext	"	"	2	B & R	"	Roller	"	"
106	Flanders	S	102	32x3	32x3	"	"	"	"	"	"	3	"	"	"	"	"	"	"	2	"	"	"	"	"
107	Ford	T	100	30x3	30x3½	Cross	Cross	I B	M D	Steel	Plan	2	U M	"	"	"	.....	.....	.....	.....	.....	.....	.....	.....	.....
108	Four-Wheel Drive	A	134	36x4½	36x4½	½ El	½ El	Float	"	"	Sel	3	Amid	"	RR&S	Float	.....	.....	Plain	3	Ball	Roller	Roller	Plain	"
109	Franklin	G-Runabout	100	32x3½	32x4	El	El	Tube	"	S & B	"	3	"	"	Springs	Semi-F	Trans	Ext	"	5	"	"	Ball	"	Plain
110	Franklin	G-Touring	103	32x4	32x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	5	"	"	"	"	"
111	Franklin	25	108	34x4	34x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	5	"	"	"	"	"
112	Franklin	M	116	34x4	34x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	7	"	"	"	"	"
113	Franklin	D	123	36x4½	37x5	"	"	"	"	"	"	3	"	"	"	"	"	"	"	7	"	"	"	"	"
114	Franklin	H	126	36x4½	37x5	"	"	"	"	"	"	3	"	"	"	"	"	"	"	7	"	"	"	"	"
115	Frontenac	E	123	34x4	34x4½	½ El	½ El	I B	Cone	L & C	"	3	"	"	R R	Float	Ext	Int	"	3	"	Ball	"	Ball	"
116	Garford	G-12	119	34x4½	34x4½	"	Plat	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	Ball
117	Garford	G-8	119	36x4½	36x4½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
118	Garford	G-14	138½	36x4½	37x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
119	G. J. G	Junior	104	32x3½	32x3½	"	El	"	M D	Steel	"	3	U M	"	"	Semi-F	.....	Ext	"	3	"	"	"	Plain	Plain
120	G. J. G	Senior	121	34x4	34x4	"	¾ El	"	Cone	Leath	"	3	Amid	"	T T	Float	.....	"	"	3	"	"	"	B & P	"
121	Glide	....	120	36x4½	36x4½	"	½ El	"	M D	Steel	"	3	R A	"	"	Semi-F	Ext	Int	"	5	Roller	Roller	Roller	"	"
122	Great Eagle	4-50	135	36x..	....	....	....	"	Cone	.....	"	3	Amid	"	.....	Float	"	"	.....	..	.....	"	"	.....	.....
123	Great Eagle	6-60	138	36x4½	37x5	....	....	"	"	L & S	"	3	"	"	.....	"	"	"	.....	..	.....	"	"	.....	.....
124	Great Southern	30	113	34x4	34x4	½ El	¾ El	"	M D	S & R	"	3	U M	"	T T	Semi-F	Int	Ext	Plain	2	Ball	Ball	Ball	Plain	"
125	Great Southern	50	128	..x4	..x4½	"	"	"	Cone	Leath	"	3	Amid	"	"	Float	"	"	"	3	Roller	Roller	Roller	"	"
126	Great Western	40	114	34x3½	34x3½	"	"	"	"	Ray	"	3	"	"	"	Semi-F	Ext	Int	"	5	"	Ball	"	"	"

Note—Abbreviations: Clutch: M. D., multiple disk; Con., contracting band; Exp., expanding band. Friction surface: Lin., linobestos; Ther., thermoid; A., asbestos; F., fiber; B., bronze; Leath., leather; S., steel. Gearset location: Amid., amidship; U. M., in unit with the motor; R. A., on the rear axle. Drive: Worm, shaft with worm gear. Car drives through: T. T., torsion tube; R. R., radius rod; T. R., torsion rods; S., springs. Brakes: Int., internal expanding on rear hubs; Ext., external contracting on rear hubs; Trans., on transmission. Springs: El., elliptic. Front Axle: I. B., I-beam; Chan., channel.

Motor Specifications of Pleasure Cars Made by American Manufacturers for the Season of 1912

Table No.	NAME OF CAR	CHASSIS MODEL	No. of Cylinders	Bore	Stroke	S. A. E. H. P.	Piston Disp.	Cyl. Type	Cylinders How Cast	Valve Location	COOLING		IGNITION			CARBURETER		Motor Lubrication
											Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed	
127	Great Western	40	4	4.25	5.00	28.9	283.6	L-Head	Separate	Hd. & Side	Pump	Tube	Dual	Remy	Hand	Schebler	Gravity	Splash
128	Grout	35	4	4.50	5.00	32.4	327.0	"	"	Lt. Side	"	"	"	Bosch	"	"	"	"
129	Grout	45	4	4.75	5.00	36.1	354.4	"	"	"	"	Cell	"	Optional	"	"	"	"
130	Halladay	30	4	3.75	5.25	22.5	231.9	"	En Bloc	"	"	"	"	Splitdorf	"	"	"	"
131	Halladay	40	4	4.50	5.00	32.4	318.1	"	Separate	"	"	"	Double	Bosch	"	"	Pressure	"
132	Halladay	50	4	4.75	5.00	36.1	354.4	"	"	"	"	"	"	"	"	"	"	"
133	Haynes	20	4	4.25	5.00	28.9	283.6	T-Head	Pairs	Opposite	"	"	Dual	Eisemann	"	Stromberg	Gravity	"
134	Haynes	21	4	4.50	5.50	32.4	349.9	"	"	"	"	"	"	"	"	"	"	"
135	Haynes	Y	4	5.00	5.50	40.0	431.9	"	"	"	"	"	"	Bosch	"	"	"	"
136	Havers	6-44	6	3.75	5.00	33.8	331.4	L-Head	"	Rt. Side	Thermal	"	"	"	"	"	"	"
137	Henry	W	4	4.00	4.50	25.6	226.2	"	En Bloc	"	"	Tube	"	Sp itdorf	"	Schebler	"	"
138	Henry	C	4	4.13	5.25	27.3	280.6	"	"	Lt. Side	Pump	"	"	"	"	Rayfield	"	"
139	Herreshoff	25	4	3.38	3.75	18.3	134.2	"	"	"	Thermal	"	Single	Bosch	Fixed	Stromberg	Optional	"
140	Herreshoff	25-Touring	4	3.38	3.75	18.3	134.2	"	"	"	"	"	"	"	"	"	Pressure	"
141	Hudson	Roadster	4	4.00	4.50	25.6	226.2	"	"	"	Pump	"	Dual	"	Hand	"	"	"
142	Hudson	Touring	4	4.00	4.50	25.6	226.2	"	"	"	"	"	"	"	"	"	Gravity	"
143	Hupmobile	Runabout	4	3.75	3.38	16.9	149.1	"	Pairs	"	Thermal	"	Single	"	Fixed	Breeze	"	"
144	Hupmobile	Touring	4	3.25	3.38	16.9	149.1	"	"	"	"	"	"	"	"	"	"	"
144-A	Hupmobile	32	4	3.25	5.50	16.9	182.5	"	En Bloc	"	"	"	"	"	Hand	.....	"	"
145	Illinois	1912	4	4.25	4.75	28.9	269.4	"	Pairs	"	Pump	Cell	Double	Remy	"	Schebler	Pressure	"
146	Imperial	32-33	4	4.13	4.25	27.3	280.6	"	"	"	Thermal	Tube	Dual	"	"	"	Gravity	"
147	Imperial	34	4	4.31	5.25	29.3	306.7	"	"	"	"	"	"	"	"	"	"	"
148	Imperial	44	4	4.50	5.25	32.4	334.0	"	"	"	"	"	"	"	"	"	"	"
149	Imperial	50-51	4	4.75	5.25	36.1	372.1	"	"	"	"	"	"	"	"	Optional	"	"
150	Inter-State	30-A	4	4.50	5.00	32.4	318.1	"	"	"	Pump	Cell	Double	U & H	"	Special	"	"
151	Inter-State	40	4	4.50	5.50	32.4	349.9	"	En Bloc	"	"	"	"	†	"	"	Pressure	"
152	Inter-State	50	4	5.00	6.00	40.0	471.2	T-Head	Pairs	Opposite	"	"	"	U & H	"	"	"	"
153	Jackson	26-28	4	4.00	4.00	25.6	201.1	L-Head	"	Lt. Side	Thermal	"	Dual	Splitdorf	"	Schebler	Gravity	"
154	Jackson	32	4	4.00	4.00	25.6	201.1	"	"	"	"	"	"	Kingston	"	"	"	"
155	Jackson	42	4	4.50	4.50	32.4	286.3	I-Type	"	Head	"	"	"	"	"	"	"	"
156	Jackson	52	4	4.75	4.75	36.1	336.7	"	En Bloc	"	"	"	"	"	"	"	"	"
157	Jenkins	50	4	4.75	5.50	36.1	389.9	T-Head	.....	Opposite	"	"	"	Bosch	"	"	"	"
158	Johnson	A	4	4.25	4.50	28.9	255.6	L-Head	Pairs	Lt. Side	Pump	"	"	"	"	Stromberg	"	"
159	Johnson	B	4	4.50	5.25	32.4	334.0	"	"	"	"	"	"	"	"	"	"	"
160	Johnson	C	4	5.00	5.50	40.0	431.9	"	"	"	"	"	"	"	"	"	"	"
161	Jonz	B	3	3.75	4.25	.....	225.9	2-Cycle	Separate	.....	Thermal	Tube	"	"	"	Own	"	Force
162	Jonz	B-air-cooled	3	3.75	4.25	.....	225.9	"	"	.....	Air	.....	"	"	"	"	"	"
163	Jonz	D	4	4.50	5.50	32.4	349.9	L-Head	Pairs	Lt. Side	Pump	Cell	"	"	"	Schebler	Pressure	Splash
164	Kenmore	D	4	3.38	3.25	18.3	116.3	"	En Bloc	"	Thermal	Tube	Single	"	Fixed	Optional	Gravity	"
165	King	36	4	3.81	5.13	23.2	234.0	"	"	Side	"	"	Dual	"	Hand	Special	"	"
166	Kisselkar	30	4	4.25	4.25	28.9	241.1	"	Pairs	"	Pump	"	"	Optional	"	Stromberg	"	"
167	Kisselkar	40	4	4.50	4.75	32.4	302.2	"	"	"	"	"	"	"	"	"	"	"
168	Kisselkar	50	4	4.88	5.00	38.0	373.3	"	"	"	"	"	"	"	"	"	"	"
169	Kisselkar	60	6	4.50	4.75	48.6	454.3	"	"	"	"	"	"	"	"	"	"	"
170	Klinekar	4-30	4	4.00	4.63	25.6	232.5	"	Separate	Rt. Side	"	"	Double	Bosch	"	Flechter	"	"
171	Klinekar	4-40	4	4.25	5.50	28.9	312.0	T-Head	Pairs	Opposite	"	"	"	"	"	"	"	"
172	Klinekar	6-50	6	4.09	5.00	40.2	394.5	"	Separate	"	"	"	"	"	"	"	"	"
173	Klinekar	6-60	6	4.25	5.50	43.8	468.0	"	Pairs	"	"	"	"	"	"	"	"	"
174	Knox	R	4	5.00	4.75	40.0	373.0	I-Type	Separate	Head	"	"	"	"	"	Stromberg	"	Forced
175	Knox	R	4	5.00	4.75	40.0	373.0	"	"	"	"	"	"	"	"	"	"	"
176	Knox	R-45	4	5.00	5.50	40.0	431.9	"	"	"	"	"	"	"	"	"	"	"
177	Knox	S	6	5.00	4.75	60.0	459.5	"	Pairs	"	"	"	"	"	"	"	"	"
178	Krit	A	4	3.75	4.00	22.5	132.7	L-Head	En Bloc	Rt. Side	Thermal	"	Single	"	Fixed	"	"	Splash
179	Krit	K	4	3.75	4.00	22.5	132.7	"	"	"	"	"	"	"	"	"	"	"
180	Lambert	66-B	4	4.13	4.50	27.3	240.5	"	"	Lt. Side	Pump	"	Dual	Remy	Hand	Schebler	"	"
181	Lambert	66-C	4	4.13	4.50	27.3	240.5	"	"	"	"	"	"	"	"	"	"	"
182	Lambert	99-C	4	4.13	5.25	27.3	280.6	"	Separate	"	"	"	"	"	"	"	"	"
183	Lambert	99-B	4	4.13	5.25	27.3	280.6	"	"	"	"	Cell	"	"	"	"	"	"
184	Lambert	99-A	4	4.50	5.00	32.4	318.1	"	"	"	"	"	"	"	"	"	"	"
185	Leader	40	4	4.50	5.25	32.4	334.0	"	Pairs	"	Thermal	"	"	"	"	"	"	"
186	Lenox	.....	4	4.13	5.25	27.3	280.6	"	"	Side	Pump	"	"	.....	"	Sauer	"	Forced
187	Lexington	DF	4	4.13	5.25	27.3	280.6	"	Separate	Lt. Side	"	"	Double	Bosch	"	Schebler	Pressure	Splash
188	Lexington	F	4	4.50	5.00	32.4	318.1	"	"	"	"	"	"	"	"	"	"	"
189	Lion	40	4	4.50	5.00	32.4	318.1	"	Pairs	Hd.&Side	"	Tube	Dual	Kingston	"	Stromberg	Gravity	"

Note—*Garford models G-8 and G-12 have magnetic spark plugs. †Inter-State 40 has Apico combined lighting, ignition and starting system. Abbreviations: Thermal, thermo-syphon water circulation; Tube., tubular radiators; Cell., cellular or honeycomb radiator.
Bore and stroke are given in decimals to the nearest 1-100th inch: as, 4.50=4½, etc., .06=1-16, .13=⅛, .19=3-16, .25=¼, .31=5-16, .38=⅜, .81=13-16, .88=⅞, .=⅜, .44=7-16, .50=½, .56=9-16, .63=⅝, .69=11-16, .75

Tubular radiators; Cell., cellular or honeycomb radiator.
Bore and stroke are given in decimals to the nearest 1-100th inch: as, 4.50=4½, etc., .06=1-16, .13=⅛, .19=3-16, .25=¼, .31=5-16, .38=⅜, .44=7-16, .50=½, .56=9-16, .63=⅝, .69=11-16, .75=¾, .81=13-16, .88=⅞, .94=15-16.

Transmission and Running Gear Specifications of American Pleasure Cars for the 1912 Season

Table No.	NAME OF CAR	CHASSIS MODEL	RUNNING GEAR								TRANSMISSION						BRAKES		BEARINGS					
									CLUTCH		GEARSET								Crankshaft					
			Wheel-base	Front Tires	Rear Tires	Front Springs	Rear Springs	Front Axle	Type	Friction Surface	Type	No. Spds	Loc.	Drive	Car Drives Thru	Rear Axle	Service	Em.	Type	No.	Gearset	Front Wheel	Rear Axle	Str'ng Knu'le	Str'ng Gear
127	Great Western	40	114	35x4	35x4	½ El	¾ El	I B	Cone	Ray	Sel	3	Amid	Shaft	T T	Semi-F	Ext	Int	Plain	5	Roller	Ball	Roller	Plain	Plain
128	Grout	35	116	34x4	34x4	"	Plat	"	"	L & I	"	3	"	"	Springs	"	"	"	"	5	"	"	"	"	Ball
129	Grout	45	123	36x4	36x4	"	"	"	"	"	"	3	"	"	R R	Float	"	"	"	5	"	Roller	"	"	"
130	Halladay	30	114	32x3½	32x3½	"	El	"	"	"	"	3	"	"	"	Semi-F	Int	"	"	3	Ball	Ball	"	Plain	B & P
131	Halladay	40	119	36x4	36x4	"	¾ El	Chan	M D	Steel	"	3	"	"	"	Float	"	"	"	5	"	"	Ball	"	"
132	Halladay	50	128	36x4½	36x4½	"	"	I B	"	"	"	3	"	"	"	"	"	"	"	5	"	"	"	"	"
133	Haynes	20	114	34x4	34x4	"	"	"	Con	S & B	"	3	U M	"	Springs	"	Ext	"	"	3	Roller	Roller	Roller	Plain	Plain
134	Haynes	21	120	36x4	36x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	Plain	Roller
135	Haynes	Y	127½	36x4½	37x5	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	Roller	Plain
136	Havers	6-44	122	36x4	36x4	"	Plat	"	M D	S & R	"	3	"	"	R R	"	"	"	"	4	Ball	Ball	B & Rl	Plain	"
137	Henry	W	115½	34x4	34x4	"	El	"	"	"	"	3	R A	"	"	Semi-F	"	"	"	2	Roller	"	"	"	B & Pl
138	Henry	C	116	34x4	34x4	"	"	"	"	"	"	3	U M	"	"	Float	"	"	"	3	Ball	"	"	"	"
139	Herreshoff	25	100	32x3	32x3	"	½ El	"	"	Steel	"	3	"	"	T T	Semi-F	"	"	"	2	Plain	"	"	"	Plain
140	Herreshoff	25-Touring	110	32x3½	32x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	2	"	"	"	"	"
141	Hudson	Roadster	114½	32x4	32x4	"	¾ El	"	"	S & C	"	3	"	"	"	Float	"	"	"	2	Ball	Roller	Roller	Ball	Ball
142	Hudson	Touring	114½	34x4	34x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	2	"	"	"	"	"
143	Hupmobile	Runabout	86	30x3	30x3	"	Cross	"	"	Steel	"	2	"	"	"	Semi-F	Int	Ext	"	3	Plain	"	"	Plain	Plain
144	Hupmobile	Touring	110	30x3	31x3½	"	"	"	"	"	"	2	"	"	"	"	"	"	"	3	"	"	"	"	"
144-A	Hupmobile	32	106	30x3½	30x3½	"	"	"	"	"	"	3	"	"	"	"	Ext	Int	"	3	Roller	"	"	"	"
145	Illinois	1912	120	36x3½	37x4	El	El	"	"	"	"	3	Amid	"	TT&RR	Float	Int	"	"	3	Ball	Ball	Ball	Ball	Ball
146	Imperial	33-32	114	34x3½	34x3½	½ El	½ El	"	"	"	"	3	U M	"	T T	Semi-F	Ext	"	"	3	....	"	Roller	Plain	Plain
147	Imperial	34	116	34x4	34x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	....	"	"	"	"
148	Imperial	44	120	36x4	36x4	"	"	"	"	"	"	3	"	"	"	Float	"	"	"	3	....	"	Ball	"	"
149	Imperial	50-51	118	34x4	34x4	El	El	"	Cone	Leath	"	3	Amid	"	R R	Semi-F	"	"	"	3	....	"	Roller	"	"
150	Inter-State	30-A	118	34x4	34x4	½ El	¾ El	T B	M D	S & B	"	3	"	"	T T	"	Int	Ext	"	3	Ball	"	Ball	Ball	Ball
151	Inter-State	40	118	36x4	36x4	"	"	"	"	"	"	3	"	"	"	Float	"	"	"	3	"	"	"	"	"
152	Inter-State	50	124	36x4½	36x4½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
153	Jackson	26-28	110	32x3½	32x3½	El	El	I B	Cone	L & I	"	3	U M	"	R R	Semi-F	....	....	"	3	B & Pl	"	B & Rl	Plain	"
154	Jackson	32	110	32x3½	32x3½	"	"	"	"	"	"	3	"	"	"	"	....	....	"	3	"	"	"	"	"
155	Jackson	42	118	34x4	34x4	"	"	"	M D	Iron	"	3	"	"	"	"	....	....	"	3	"	"	"	"	"
156	Jackson	52	124	36x4	36x4	"	"	"	"	"	"	3	"	"	"	"	....	....	"	5	"	"	"	"	"
157	Jenkins	50	118	36x..	36x..	½ El	½ El	"	Cone	Leath	Prog	3	....	"	....	Float	....	....	.....	..	....	Roller	Roller	....	....
158	Johnson	A	112	34x3½	34x3½	"	"	Chan	"	"	Sel	3	Amid	"	TT&RR	"	Int	Int	Plain	3	Ball	Ball	Ball	Plain	B & Pl
159	Johnson	B	112	36x4	36x4	"	½ El	I B	"	"	"	3	"	"	"	"	"	Ext	"	3	"	"	"	"	"
160	Johnson	C	124	36x4½	36x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
161	Jonz	B	104	32x3½	32x3½	"	¾ El	"	M D	Steel	"	3	"	"	TT&S	Semi-F	"	"	"	4	Roller	"	Roller	Ball	Roller
162	Jonz	B-air-cooled	104	32x3½	32x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	4	"	"	"	"	"
163	Jonz	D	120	36x4	36x4	"	Plat	"	"	S & R	"	3	U M	"	T T	Float	"	"	"	3	"	"	B & Rl	Plain	Ball
164	Kenmore	D	100	30x3	30x3	"	El	Tube	"	Steel	"	2	"	"	....	Semi-F	"	"	"	3	Plain	"	Roller	"	Plain
165	King	36	115	34x4	34x4	"	Plat	Chan	"	"	"	3	"	"	T T	"	.....	.....	"	2	"	"	"	"	"
166	Kisselkar	30	116	34x4	34x4	"	¾ El	I B	Cone	L & I	"	3	Amid	"	Springs	Float	Ext	Int	"	3	Ball	Roller	"	"	B & P
167	Kisselkar	40	118	35x4½	35x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
168	Kisselkar	50	124	36x4½	36x4½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
169	Kisselkar	60	132	37x5	37x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	4	"	"	"	Roller	"
170	Klinekar	4-30	118	34x4	34x4	"	"	"	"	Leath	"	4	"	"	"	"	.....	.....	"	5	"	Ball	B & Rl	B & Pl	"
171	Klinekar	4-40	118	36x4	36x4	"	"	"	"	"	"	4	"	"	"	"	....	....	"	5	"	"	Ball	"	"
172	Klinekar	6-50	126	36x4½	36x4½	"	"	"	"	"	"	4	"	"	"	"	....	....	"	7	"	"	"	"	"
173	Klinekar	6-60	130	38x4½	38x4½	"	"	"	"	"	"	4	"	"	"	"	....	....	"	7	"	"	"	"	"
174	Knox	R	117	36x4½	36x4½	"	"	"	M D	I & C	"	3	U M	"	T&RR	Semi-F	Ext	Int	"	5	Ball	Roller	"	Roller	B & Pl
175	Knox	R	122	36x4½	36x4½	"	"	"	"	"	"	3	"	"	"	Float	"	"	"	5	"	"	"	"	"	"
176	Knox	R-45	126	37x5	37x5	"	"	"	"	"	"	3	"	"	"	"	"	"	"	5	"	"	"	"	"	"
177	Knox	S	134	38x5½	38x5½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	4	"	"	"	"	"	"
178	Krit	A	96	32x3	32x3	"	½ El	"	"	Steel	"	2	"	"	T T	Semi-F	"	"	Ball	2	"	Ball	Roller	Plain	Ball
179	Krit	K	106	32x3½	32x3½	"	El	"	"	"	"	3	"	"	"	"	"	"	"	2	"	"	"	"	"
180	Lambert	66-B	107	32x3½	32x3½	"	"	Tube	....	....	Frict	.....	Amid	Chain	R R	"	"	"	"	2	Roller	"	"	Ball	Ball
181	Lambert	66-C	112	34x3½	34x3½	"	"	I B	....	....	"	.....	"	"	"	"	"	"	"	2	"	"	"	"	"
182	Lambert	99-C	112	35x4	35x4	"	"	"	....	....	"	.....	"	"	"	"	"	"	Plain	5	"	"	"	"	"
183	Lambert	99-B	115	35x4	35x4	"	"	"	....	....	"	.....	"	"	"	"	"	"	"	5	"	"	"	"	"
184	Lambert	99-A	115	34x4	34x4	"	"	"	....	....	"	.....	"	"	"	"	"	"	"	3	"	"	"	"	"
185	Leader	40	124	36x4	36x4	"	½ El	"	M D	Steel	Sel	3	U M	Shaft	S&TT	Float	Int	"	"	3	Ball	"	Ball	Plain	Plain
186	Lenox	....	116	34x4	34x4	"	"	"	Cone	Leath	"	3	R A	"	T T	Semi-F	Ext	"	"	3	"	"	"	"	"
187	Lexington	D-F	117	34x4	34x4	"	"	"	"	"	"	3	U M	"	Springs	Float	"	"	"	5	"	Roller	Roller	"	"
188	Lexington	F	122	36x4	36x4	"	"	"	"	"	"	3	Amid	"	"	"	"	"	"	5	"	"	"	"	"
189	Lion	40	116	36x4	36x4	"	"	"	"	R & I	"	3	U M	"	T R	"	Int	"	"	3	Roller	Ball	Ball	"	B & Pl

Note—Abbreviations: Clutch: M. D., multiple disk; Con., contracting band; Exp., expanding band. Friction surface: Lin., linobestos; Ther., thermoid; A., asbestos; F., fiber; B., bronze; Leath., leather; S., steel. Gearset location: Amid., amidship; U. M., in unit with the motor; R. A., on the rear axle. Drive: Worm, shaft with worm gear. Car drives through: T. T., torsion tube; R. R., radius rod; T. R., torsion rods; S., springs. Brakes: Int., internal expanding on rear hubs; Ext., external contracting on rear hubs; Trans., on transmission. Front Axle: I. B., I-beam; T. B., T-beam; Chan., channel.

Motor Specifications of Pleasure Cars Made by American Manufacturers for the Season of 1912

Table No.	NAME OF CAR	CHASSIS MODEL	No. of Cylinders	Bore	Stroke	S. A. E. H. P.	Piston Disp.	Cyl. Type	Cylinders How Cast	Valve Location	COOLING		IGNITION			CARBURETER		Motor Lubrication
											Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed	
190	Locomobile	L-4	4	4.50	4.50	32.4	286.3	T-Head	Pairs	Opposite	Pump	Cell	Dual	Bosch	Hand	Own	Gravity	Splash
191	Locomobile	M-2	6	4.50	4.50	48.6	429.5	"	"	"	"	"	"	"	"	"	"	"
191-A	Locomobile	Little 6	6	4.25	5.00	43.8	425.4	"	"	"	"	"	"	"	"	"	"	"
192	Lozier	46	4	5.38	6.00	46.0	544.6	"	"	"	"	"	Double	"	"	"	Pressure	"
193	Lozier	51	6	4.63	5.50	51.6	454.4	"	"	"	"	"	"	"	"	"	"	"
194	Luverne	540	4	4.38	4.75	30.6	285.6	L-Head	"	Lt. Side	"	Tube	"	"	"	Schebler	Gravity	"
195	Luverne	750	4	4.75	5.00	36.1	354.4	"	Separate	"	"	"	"	"	"	"	"	"
196	Marathon	K-20 Road	4	3.25	3.50	16.9	116.1	"	Pairs	Side	Thermal	"	Dual	Remy	"	Kingston	"	"
197	Marathon	K-20 Tour.	4	3.25	3.50	16.9	116.1	"	"	"	"	"	"	"	"	"	"	"
198	Marathon	L-30	4	4.00	4.50	25.6	226.2	"	"	"	"	"	"	"	"	Schebler	"	"
199	Marathon	M-40	4	4.25	4.50	28.9	255.3	"	"	"	"	"	"	"	"	"	"	"
200	Marathon	M-40 Tour.	4	4.25	4.50	28.9	255.3	"	"	"	"	"	"	"	"	"	"	"
201	Marathon	N-50	4	4.50	5.13	32.4	326.1	"	"	"	"	"	"	"	"	"	"	"
202	Marion	35	4	4.00	4.50	25.6	226.2	"	Separate	Lt. Side	"	Cell	"	.....	"	"	"	Forced
203	Marion	36-37	4	4.00	5.00	25.6	251.3	"	Pairs	"	Pump	"	"	.....	"	"	"	Splash
204	Marion	46-47-48	4	4.13	5.50	27.3	294.0	"	"	"	"	"	"	.....	"	"	"	"
205	Marmon	32	4	4.50	5.00	32.4	318.1	T-Head	"	Opposite	"	"	"	Bosch	"	"	"	Forced
205-A	Marmon	6	6	....	....	....	.....	"	.....	"	"	"	.....	"	"	"	"	"
206	Marquette	22-27	4	5.00	5.00	40.0	392.7	"	Pairs	"	"	"	Double	"	"	"	"	Splash
207	Marquette	28	4	5.00	5.25	40.0	412.3	"	"	"	"	"	"	Splitdorf	"	Zenith	"	"
208	Matheson	50	6	4.50	5.00	48.6	477.2	I-Type	"	In Head	"	"	"	Bosch	"	Stromberg	Pressure	"
209	Matheson	50	6	4.50	5.00	48.6	477.2	"	"	"	"	"	"	"	"	"	"	"
210	Maxwell	Messenger	2	4.50	4.00	16.2	127.3	L-Head	Separate	Side	Thermal	Tube	Dual	Splitdorf	"	Own	Gravity	"
211	Maxwell	Mascotte	4	4.00	4.00	25.6	201.1	T-Head	Pairs	Opposite	"	"	"	"	"	"	"	"
212	Maxwell	Mercury	4	4.13	4.13	28.9	241.1	"	Separate	"	"	"	"	Bosch	"	Stromberg	"	"
213	Maxwell	Special	4	4.13	5.13	28.9	297.8	"	"	"	"	"	"	Splitdorf	"	"	"	"
214	McFarlan	40-45	6	4.00	5.00	38.4	377.0	"	Threes	"	Pump	Cell	"	.....	.....	.....	.....	"
215	McFarlan	55-60	6	4.25	5.00	43.8	426.4	I-Type	"	Head	"	"	"	.....	.....	.....	.....	"
216	McIntyre	F-12	4	4.00	5.00	25.6	251.3	T-Head	Separate	Opposite	"	Tube	"	Briggs	Hand	.....	Gravity	"
217	Mercer	35-R	4	4.38	5.00	30.6	300.7	"	Pairs	"	"	Cell	Single	Bosch-2	"	Schebler	Pressure	"
218	Mercer	35-A & B	4	4.50	5.00	32.4	318.1	"	"	"	"	"	Dual	"	"	Flechter	"	"
219	Metz	22	4	3.75	4.00	22.5	176.7	L-Head	En Bloc	Side	Thermal	Tube	Single	Bosch	Fixed	Holley	Gravity	"
220	Midland	L-3	4	4.50	5.00	32.4	318.1	T-Head	Pairs	Opposite	Pump	Cell	Double	Splitdorf	Hand	Own	"	"
221	Midland	R	4	4.50	5.00	32.4	318.1	"	"	"	"	"	"	"	"	"	"	"
222	Midland	0	6	4.36	5.00	45.5	450.0	"	"	"	"	"	"	Mea	"	"	"	"
223	Mitchell	2-4	4	3.75	5.50	22.5	242.9	L-Head	"	Lt. Side	"	Tube	Dual	Splitdorf	"	Stromberg	"	"
223-A	Mitchell	4-4	4	3.75	5.50	22.5	242.9	"	"	"	"	"	"	"	"	"	"	"
224	Mitchell	5-4	4	4.25	5.00	28.9	283.6	"	"	Hd.&Side	"	"	"	"	"	Holley	"	"
225	Mitchell	5-6 & 2-6	6	3.75	5.50	33.8	364.3	"	"	Lt. Side	"	Cell	"	"	"	Stromberg	"	"
226	Mitchell	7-6	6	4.50	5.00	48.6	465.3	"	"	Side	"	"	"	"	"	"	"	"
227	Moline	35 Touring	4	4.00	6.00	25.6	301.6	"	"	Lt. Side	Thermal	Tube	Double	"	"	Schebler	"	"
228	Moline	35 Roadster	4	4.00	6.00	25.6	301.6	"	"	"	"	"	"	"	"	"	"	"
229	Moon	30	4	4.50	5.00	32.4	318.1	T-Head	"	Opposite	Pump	Cell	Dual	Remy	"	Stromberg	"	"
230	Moon	40	4	4.50	5.00	32.4	318.1	"	"	"	"	"	"	"	"	"	"	"
231	Moon	45	4	4.75	5.00	36.1	354.4	I-Type	"	Head	"	"	"	Bosch	"	"	"	"
232	Morse	D	4	4.63	5.00	34.3	336.0	"	Separate	"	"	"	"	Eisemann	"	.....	"	"
233	*Motorette	R	2	3.25	3.75	....	62.2	2-Cycle	"	.....	Thermal	Tube	Single	.....	"	Own	"	In Fuel
234	National	Roadster	4	5.00	5-11-16	40.0	446.7	T-Head	Pairs	Opposite	Pump	Cell	Double	Splitdorf	"	Schebler	Pressure	Forced
235	National	Touring	4	5.00	5.69	40.0	446.7	"	"	"	"	"	"	Bosch	"	"	Gravity	"
236	New Parry	35	4	4.25	4.13	28.9	234.0	I-Type	"	In Head	"	"	Dual	Optional	"	"	"	Splash
237	Oakland	30	4	4.00	4.00	25.6	201.1	L-Head	"	Lt. Side	"	Tube	"	Remy	"	"	"	"
238	Oakland	40	4	4.13	4.75	27.3	253.9	"	"	"	"	"	"	"	"	"	"	"
239	Oakland	45	4	4.50	5.25	32.4	334.0	"	"	"	"	"	"	Bosch	"	"	"	"
240	*Octoauto	.....	4	4.38	4.50	30.6	270.6	"	Separate	Side	Thermal	Cell	"	.....	.....	"	"	"
241	Ohio	Regular	4	4.50	4.75	32.4	302.2	T-Head	Pairs	Opposite	Pump	"	"	Bosch	Hand	"	"	"
242	Ohio	Speedster	4	4.47	4.75	33.3	298.1	"	"	"	"	"	Double	"	"	"	"	"
243	Oldsmobile	Defender	4	4.00	6.00	25.6	301.6	"	"	"	"	"	Dua	"	"	Own	Pressure	Forced
244	Oldsmobile	Autocrat	4	5.00	6.00	40.0	471.2	"	"	"	"	"	"	"	"	"	"	"
245	Oldsmobile	Limited	6	5.00	6.00	60.0	706.8	"	"	"	"	"	"	"	"	"	"	"
246	Only	.....	4	4.25	7.87	28.9	446.8	"	En Bloc	"	Thermal	Tube	Double	"	"	"	Gravity	"
247	Otto	.....	4	4.25	4.50	28.9	255.3	"	Pairs	"	Pump	Cell	Dual	"	"	Stromberg	"	Splash
248	Overland	58	4	3.75	4.50	22.5	198.8	L-Head	Separate	Lt. Side	Thermal	Tube	"	Splitdorf	"	Schebler	"	Forced
249	Overland	59	4	4.00	4.50	25.6	226.2	"	"	"	"	"	"	"	"	"	"	"

Note—*Motorette has three wheels; Octauto has eight wheels. Abbreviations: Thermal, thermo-syphon water circulation; Tube., tubular radiator; Cell., cellular or honeycomb radiator. Bore and stroke are given in decimals to the nearest 1-100th inch: as, 4.50=4½, etc., .06=1-16, .13=⅛, .19=3-16, .25=¼, .31=5-16, .38=⅜, .44=7-16, .50=½, .56=9-16, .63=⅝, .69=11-16, .75=¾, .81=13-16, .88=⅞, .94=15-16, 1=1.00.

Transmission and Running Gear Specifications of American Pleasure Cars for the 1912 Season

Transmission and Running Gear Specifications of American Pleasure Cars for the 1912 Season

Table No.	NAME OF CAR	CHASSIS MODEL	RUNNING GEAR								TRANSMISSION						BRAKES		BEARINGS						
									CLUTCH		GEARSET			Drive	Car Drives Thru	Rear Axle			Crank shaft		Gearset	Front Wheel	Rear Axle	Str'ng Knu'	Str'ng Gear
			Wheel-base	Front Tires	Rear Tires	Front Springs	Rear Springs	Front Axle	Type	Friction Surface	Type	No. Spds	Loc.				Service	Em.	Type	No.					
190	Locomobile	L-4	120	34x4½	34x4½	½ El	½ El	I B	M D	Leath	Sel	4	Amid	Shaft	T T	Float	Ext	Int	Plain	5	Ball	Roller	Ball	Plain	Plain
191	Locomobile	M-2	135	36x4	37x5	"	¾ El	"	"	Steel	"	4	"	"	"	"	"	"	"	7	"	"	Roller	"	Roller
191-A	Locomobile	Little 6	128	36x4½	36x4½	"	"	"	"	"	"	4	"	"	T&RR	"	"	Ext	"	7	"	"	Ball	"	"
192	Lozier	46	124	36x4	36x5	"	Plat	"	"	"	"	4	"	"	R R	"	"	Int	Ball	3	"	Ball	"	B & Pl	B & Pl
193	Lozier	51	131	36x4	36x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	4	"	"	"	"	"
194	Luverne	540	124	34x4	34x4	"	El	"	"	"	"	4	"	"	....	"	....	....	Plain	3	Roller	"	B & Rl	Ball	Ball
195	Luverne	750	128	36x4½	36x4½	"	"	"	"	"	"	4	"	"	....	"	....	....	"	3	"	"	"	"	"
196	Marathon	K-20 Road	90	....	....	"	"	"	"	"	Prog	2	U M	"	....	Semi-F	Ext	Int	"	3	Ball	"	Roller	"	"
197	Marathon	K-20 Tour.	96	....	....	"	"	"	"	"	"	2	"	"	....	"	"	"	"	3	"	"	"	"	"
198	Marathon	L-30	116	34x3½	34x3½	"	"	"	"	"	Sel	3	"	"	....	"	"	"	"	3	"	"	"	"	"
199	Marathon	M-40	118	34x4	34x4	"	"	"	"	"	"	3	"	"	....	Float	"	"	"	3	"	"	"	"	"
200	Marathon	M-40 Tour.	120	34x4	34x4	"	"	"	"	"	"	3	"	"	....	"	"	"	"	3	"	"	"	"	"
201	Marathon	M-50	121	37x4½	37x4½	"	"	"	"	"	"	3	"	"	....	"	Int	"	"	3	"	"	"	"	"
202	Marion	35	111	32x4	32x4	"	¾ El	"	Cone	A & I	"	3	R A	"	T T	"	"	"	"	5	"	"	"	Plain	"
203	Marion	36-37	111	34x4	34x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
204	Marion	46-47-48	120	36x4	36x4	"	"	"	"	A & Z	"	3	"	"	"	"	"	"	"	3	"	Roller	"	"	"
205	Marmon	32	120	35x4½	35x4½	"	El	"	"	Ther	"	3	"	"	"	"	"	"	"	3	"	"	B & Rl	Ball	Plain
205-A	Marmon	6	....	....	....	"	"	"	"	"	....	....	"	"	....	"	"	"	..	..	....	....	....	....	"
206	Marquette	22-27	122	36x4	36x4½	"	½ El	"	"	Leath	"	3	Amid	"	....	"	Ext	"	"	3	Ball	Ball	Ball	Plain	"
207	Marquette	28	119	36x4½	36x4½	"	Plat	"	"	"	"	4	"	"	R R	"	"	"	"	3	"	"	"	"	"
208	Matheson	50	125½	36x4	36x4½	"	El	"	M D	Steel	"	3	R A	"	T T	"	Int	Ext	"	4	"	Roller	"	Roller	Ball
209	Matheson	50	135	36x4	36x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	4	"	"	"	"	"
210	Maxwell	Messenger	86	28x3	28x3	El	"	Tube	"	S & B	Plan	2	U M	"	T R	Semi-F	Ext	Trans	"	2	Plain	Ball	Roller	Plain	Plain
211	Maxwell	Mascotte	104	32x3½	32x3½	½ El	¾ El	"	"	Steel	Sel	3	"	"	Springs	"	"	Int	"	3	P & Rl	"	B & Rl	"	"
212	Maxwell	Mercury	110	34x4	34x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	5	"	"	Roller	"	"
213	Maxwell	Special	114	34x4	34x4	"	"	I B	"	"	"	3	"	"	"	Float	"	"	"	5	"	Roller	"	"	"
214	McFarlan	40-45	124	36x4	36x4	"	El	"	"	"	"	3	R A	"	....	....	Int	"	"	3	....	....	....	....	....
215	McFarlan	55-60	128	37x4½	37x4½	"	"	"	"	"	"	3	U M	"	....	....	"	Ext	"	5	....	....	....	....	....
216	McIntyre	F-12	114	34x3½	34x3½	"	¾ El	"	"	"	"	3	R A	"	T T	Semi-F	"	"	"	3	Roller	Ball	Roller	Plain	Plain
217	Mercer	35-R	108	32x4	32x4	"	½ El	"	"	"	"	3	Amid	"	R R	Float	Trans	Int	"	3	Ball	"	Ball	Ball	Ball
218	Mercer	35 A & B	118	34x4	34x4	"	¾ El	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
219	Metz	22	90	30x3	30x3	El	El	Tube	....	....	Frict	5	"	Chain	"	Dead	Disk	....	"	3	....	"	Plain	Plain
220	Midland	L-3	115	34x4	34x4	½ El	¾ El	Chan	M D	Ray	Sel	3	U M	Shaft	T T	Float	Int	Int	"	3	Roller	Ball	"	B & Pl
221	Midland	R	118	35x4½	35x4½	"	"	I B	"	"	"	3	"	"	"	"	"	"	"	3	"	Roller	"	"	"
222	Midland	O	118	35x4½	35x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	Roller
223	Mitchell	2-4	100	32x3½	32x3½	"	El	"	Cone	Leath	"	3	R A	"	"	"	"	Ext	"	3	"	Ball	"	Plain	Plain
223-A	Mitchell	4-4	115	32x3½	32x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
224	Mitchell	5-4	112	34x4	34x4	"	¾ El	"	"	"	"	3	Amid	"	"	"	"	"	"	3	Ball	"	Roller	Ball	Ball
225	Mitchell	5-6 & 2-6	125	36x4	36x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	4	Roller	"	Ball	"	Plain
226	Mitchell	7-6	135	36x4½	36x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	5	"	"	"	"	"
227	Moline	35 Touring	114	37x4	37x4	"	El	"	"	"	"	3	U M	"	R R	Semi-F	Ext	Int	"	3	"	"	Roller	Plain	Plain
228	Moline	35 Roadster	114	36x3½	36x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
229	Moon	30	115	34x4	34x4	"	¾ El	"	M D	Steel	"	3	R A	"	"	"	"	"	"	3	"	"	B & Rl	"	"
230	Moon	40	120	36x4	36x4	"	"	"	"	"	"	3	Amid	"	Springs	Float	"	"	"	3	Ball	Roller	"	"	"
231	Moon	45	123	36x4	36x4½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	Plain	"	Ball	"	"
232	Morse	D	127	36x4½	37x5	"	El	"	"	"	"	4	"	"	T T	Semi-F	Int	"	"	5	Ball	Ball	"	B & Pl	Ball
233	Motorette	R	74	28x3	29x3½	El	Spec	....	Cone	Leath	Plan	2	U M	Chain	Springs	Dead	"	Trans	"	2	Plain	"	"	Plain	B & Pl
234	National	Roadster	124	36x4	36x4	½ El	¾ El	I B	"	L & I	Sel	3	Amid	Shaft	T T	Float	"	Ext	"	3	Ball	Roller	Roller	"	Plain
235	National	Touring	124	36x4	36x4	"	"	"	"	"	"	3	"	"	"	Semi-F	"	"	"	3	"	"	"	"	"
236	New Parry	35	116	32x..	34x..	"	El	"	"	L & S	"	3	"	"	R R	"	Ext	Int	"	3	Roller	Ball	"	Ball	"
237	Oakland	30	106	34x3½	34x3½	"	¾ El	"	"	L & I	"	3	U M	"	Springs	"	"	"	"	3	Ball	"	"	Plain	Ball
238	Oakland	40	112	34x4	34x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
239	Oakland	45	120	36x4½	35x4½	"	"	"	"	"	"	3	"	"	"	Float	"	"	"	3	"	"	Ball	Ball	"
240	*Octauto	....	175	34x3½	34x4	....	....	"	"	"	"	3	R A	"	T T	"	....	....	"	5	"	Roller	Roller	Plain	Plain
241	Ohio	Regular	115	36x4	36x4	½ El	½ El	"	M D	S & B	"	3	U M	"	S&TR	"	Ext	Int	"	4	"	"	Ball	Ball	"
242	Ohio	Speedster	105	32x4	32x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	4	"	"	"	"	"
243	Oldsmobile	Defender	116	36x4	36x4	"	¾ El	"	Cone	T & I	"	4	Amid	"	T T	"	Int	Ext	"	3	"	"	"	Roller	Ball
244	Oldsmobile	Autocrat	126	38x4½	39x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
245	Oldsmobile	Limited	140	42x4½	43x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	4	"	"	"	"	"
246	Only	....	112	31x4	31x4	"	....	"	"	Leath	"	3	R A	"	"	Semi-F	"	"	Ball	4	"	Ball	"	Ball	"
247	Otto	....	123	34x3½	34x3½	"	¾ El	"	"	"	"	3	"	"	"	Float	Ext	Int	Plain	3	....	"	"	....	....
248	Overland	58	96	32x3½	32x3½	"	El	"	M D	A & I	Plan	2	"	"	"	Semi-F	Int	Ext	"	..	Ball	....	Roller	"	Plain
249	Overland	59	106	32x3½	32x3½	"	¾ El	"	Cone	"	Sel	3	"	"	"	"	"	"	"	5	"	Ball	"	Plain	B & Pl

Note—Abbreviations: Clutch: M. D., multiple disk; Con., contracting band; Exp., expanding band. Friction surface: Lin., linobestos; Ther., thermaid; A., asbestos; F., fiber; B., bronze; Leath., leather; Z., zinc; S., steel. Gearset location: Amid., amidship; U. M., in unit with the motor; R. A., on the rear axle. Drive: Worm, shaft with worm gear. Car drives through: T. T., torsion tube; R. R., radius rod; T. R., torsion rods; S., springs. Brakes: Int., internal expanding on rear hubs; Ext., external contracting on rear hubs; Trans., on transmission. Front axle: I. B., I beam; Chan,. channel. Spring: El., elliptic. *Octauto has eight wheels.

Motor Specifications of Pleasure Cars Made by American Manufacturers for the Season of 1912

Table No.	NAME OF CAR	CHASSIS MODEL	No. of Cylinders	Bore	Stroke	S. A. E. H. P.	Piston Disp.	Cyl. Type	Cylinders How Cast	Valve Location	COOLING		IGNITION			CARBURETER		Motor Lubrication
											Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed	
250	Overland	60	4	4.13	4.50	27.3	240.5	L-Head	Separate	Lt. Side	Thermal	Tube	Dual	Remy	Hand	Schebler	Gravity	Splash
251	Overland	61	4	4.38	4.50	30.6	270.6	"	"	"	"	"	"	Bosch	"	"	"	"
252	Packard	18 Runabout	4	4.06	5.13	26.4	265.7	T-Head	Pairs	Opposite	Pump	Cell	"	Eisemann	"	Own	Pressure	"
253	Packard	18 Standard	4	4.06	5.13	26.4	265.7	"	"	"	"	"	"	"	"	"	Gravity	"
254	Packard	30 Runabout	4	5.00	6.00	40.0	471.2	"	"	"	"	"	"	"	"	"	Pressure	"
255	Packard	30 Standard	4	5.00	6.00	40.0	471.2	"	"	"	"	"	"	"	"	"	Gravity	"
256	Packard	30 Phaeton	4	5.00	6.00	40.0	471.2	"	"	"	"	"	"	"	"	"	Pressure	"
257	Packard	6 Runabout	6	4.50	5.50	48.6	424.9	"	"	"	"	"	"	Bosch	"	"	"	Forced
258	Packard	6 Standard	6	4.50	5.50	48.6	424.9	"	"	"	"	"	"	"	"	"	Gravity	"
259	Packard	6 Phaeton	6	4.50	5.50	48.6	424.9	"	"	"	"	"	"	"	"	"	Pressure	"
260	Paige	Beverly	4	3.75	4.00	22.5	176.7	L-Head	En Bloc	Lt. Side	Thermal	"	Single	"	Fixed	Meyer	Gravity	Splash
261	Palmer-Singer	6-40	6	4.00	5.00	38.4	377.0	T-Head	Threes	Opposite	Pump	"	Double	"	Hand	Own	Pressure	"
262	Palmer-Singer	46	6	4.00	5.00	38.4	377.0	"	"	"	"	"	"	"	"	"	"	"
263	Palmer-Singer	6-60	6	4.88	5.50	57.0	615.9	"	Pairs	"	"	"	"	"	"	"	"	"
	Parry (see New Parry)	.....	..	....	....	....	.....	.....										
264	Paterson	35	4	4.00	4.00	25.6	201.1	L-Head	"	Lt. Side	"	"	Dual	"	"	Schebler	Gravity	"
265	Paterson	45	4	4.50	5.25	32.4	334.0	"	"	"	"	"	"	"	"	"	"	"
266	Pathfinder	40	4	4.13	5.25	27.3	280.6	"	En Bloc	Side	Thermal	"	"	Optional	"	"	"	"
267	Peerless	D	4	4.00	4.63	25.6	232.5	"	Pairs	Lt. Side	Pump	Tube	"	Bosch	"	Own	"	"
268	Peerless	J	6	4.00	5.50	38.4	414.8	T-Head	"	Opposite	"	"	Double	"	"	"	"	"
269	Peerless	H	4	5.00	5.50	40.0	431.9	"	"	"	"	"	"	"	"	"	"	"
270	Peerless	K	6	4.50	6.00	48.6	572.6	"	"	"	"	"	"	"	"	"	"	"
271	Peerless	L	6	5.00	7.00	60.0	824.8	"	"	"	"	"	"	"	"	"	"	"
272	Penn	RF & T4	4	3.75	4.50	22.5	198.8	L-Head	En Bloc	Rt. Side	Thermal	"	Dual	Briggs	"	Schebler	"	"
273	Penn	TR-T5	4	4.13	5.50	27.3	294.0	"	"	"	Pump	"	"	"	"	"	"	"
274	Petrel	25-35	4	3.75	4.50	22.5	198.8	"	Pairs	Lt. Side	Thermal	"	"	S-X	"	Stromberg	"	"
275	Petrel	45-55-65-75	4	4.38	4.75	30.6	285.6	"	"	"	Pump	"	"	Remy	"	"	"	"
276	Pickard	.....	4	4.00	4.00	25.6	201.1	T-Head	Separate	Opposite	Air	.....	Single	K-W	"	Breese	"	"
277	Pierce-Arrow	36-R	6	4.00	5.13	38.4	386.4	"	Pairs	"	Pump	Cell	Double	Bosch	"	Own	"	"
278	Pierce-Arrow	36-T	6	4.00	5.13	38.4	386.4	"	"	"	"	"	"	"	"	"	"	"
279	Pierce-Arrow	48-R	6	4.50	5.50	48.6	424.9	"	"	"	"	"	"	"	"	"	"	"
280	Pierce-Arrow	48-T	6	4.50	5.50	48.6	424.8	"	"	"	"	"	"	"	"	"	"	"
281	Pierce-Arrow	66-R	6	5.00	7.00	60.0	829.9	"	"	"	"	"	"	"	"	"	"	"
282	Pierce-Arrow	66-T	6	5.00	7.00	60.0	829.9	"	"	"	"	"	"	"	"	"	"	"
283	Pilot	40	4	4.50	5.00	32.4	318.1	"	En Bloc	"	"	"	Single	Splitdorf	"	Schebler	"	"
284	Pope-Hartford	27	4	4.75	5.50	36.1	389.9	I-Type	Pairs	Head	"	Tube	Dual	Bosch	"	Own	"	"
285	Pope-Hartford	28	6	4.31	5.38	44.6	471.0	"	"	"	"	"	"	"	"	"	"	"
286	Pratt	40	4	4.50	4.75	32.4	302.2	L-Head	"	Lt. Side	"	Cell	"	"	"	Schebler	"	"
287	Premier	M-4	4	4.50	5.25	32.4	334.0	T-Head	"	Opposite	"	"	"	Eisemann	Gov	"	"	"
288	Premier	M-6	6	4.50	5.25	48.6	501.0	"	"	"	"	"	"	"	"	Carter	"	"
289	Pullman	4-30	4	4.09	5.00	26.4	259.2	"	"	"	"	Tube	"	Bosch	Hand	Stromberg	"	"
290	Pullman	4-40	4	4.50	5.50	32.4	349.9	"	"	"	"	Cell	"	"	"	"	"	"
291	Pullman	6-60	6	4.50	5.50	48.6	424.9	"	"	"	"	"	"	"	"	"	"	"
292	Rambler	Cross Country	4	4.50	4.50	32.4	286.3	L-Head	Separate	Rt. Side	"	Tube	"	"	"	Holley	"	"
293	Rambler	Country Club	4	5.00	5.50	40.0	431.9	"	"	"	"	"	"	"	"	Stromberg	"	"
294	Rambler	Moraine	4	5.00	5.50	40.0	431.9	"	"	"	"	"	"	"	"	"	"	"
295	Rambler	Metropolitan	4	5.00	5.50	40.0	431.9	"	"	"	"	"	"	"	"	Holley	"	"
296	Rayfield	C	6	3.56	5.00	37.2	299.0	T-Head	Pairs	Opposite	Thermal	Cell	Single	Optional	"	Own	"	"
297	R. C. H.	Runabout	4	3.25	5.00	16.9	165.9	L-Head	En Bloc	Lt. Side	"	Tube	"	Bosch	Fixed	Breeze	"	"
298	R. C. H.	Touring	4	3.25	5.00	16.9	165.9	"	"	"	"	"	"	S-X	"	"	"	"
299	Reading	40	4	5.00	6.00	40.0	471.2	T-Head	"	Opposite	Pump	"	Double	Pittsfield	Hand	Flechter	"	"
300	Regal	N	4	3.75	4.50	22.5	198.8	L-Head	"	Lt. Side	Thermal	"	Dual	Michigan	"	Schebler	"	"
301	Regal	L	4	4.13	4.00	27.3	213.8	"	Pairs	"	"	"	"	"	"	"	"	"
302	Regal	H	4	4.25	4.50	28.9	255.3	"	"	"	"	"	"	"	"	Kingston	"	"
303	Reo	Fifth	4	4.00	4.50	25.6	226.2	"	"	Head	Pump	"	Single	National	"	Holley	"	Forced
304	Republic	111-112-113	4	4.25	5.00	28.9	283.6	T-Head	"	Opposite	"	"	.....	Bosch	"	Stromberg	"	Splash
305	Richmond	N	4	4.00	4.50	25.6	226.2	"	Separate	.....	Thermal	Cell	Dual	S-X	"	Kingston	"	"
306	Richmond	M	4	4.50	5.00	32.4	318.1	.....	"	.....	Pump	"	"	"	"	"	"	"
307	Ritter	1912	4	3.25	3.38	16.9	112.0	L-Head	Pairs	Side	Thermal	Tube	"	Remy	"	.....	"	"
308	Roader	20	4	3.13	4.25	15.6	130.4	"	En Bloc	Rt. Side	"	Cell	Single	Bosch	Fixed	Own	"	"
309	Rogers	C	2	4.75	4.00	18.0	141.8	"	Separate	Side	Air	.....	"	.....	"	Kingston	"	"
310	Schacht	B	2	5.13	4.50	21.0	185.7	"	En Bloc	Rt. Side	Thermal	Cell	"	Splitdorf	Hand	Schebler	"	"
311	Schacht	G-F	4	4.31	5.00	29.2	292.1	"	"	"	Pump	"	"	.....	"	"	"	"

Note—Abbreviations: Thermal, thermo-syphon water circulation; Tube., tubular radiator; Cell., cellular or honeycomb radiator.
Bore and stroke are given in decimals to the nearest 1-100th inch: as, 4.50=4½, etc., .06=1-16, .13=⅛, .19=3-16, .25=¼, .31=5-16, .38=⅜, .44=7-16, .50=½, .56=9-16, .63=⅝, .69=11-16, .75=¾, .81=13-16, .88=⅞ .94=15-16, 1=1.00.

Transmission and Running Gear Specifications of American Pleasure Cars for the 1912 S

Transmission and Running Gear Specifications of American Pleasure Cars for the 1912 Season

Table No.	NAME OF CAR	CHASSIS MODEL	RUNNING GEAR							TRANSMISSION						BRAKES		BEARINGS						
									CLUTCH	GEARSET								Crankshaft						
			Wheel-base	Front Tires	Rear Tires	Front Springs	Rear Springs	Front Axle	Type	Friction Surface	Type	No. Spds	Loc.	Drive	Car Drives Thru	Rear Axle	Service	Em.	Type	No.	Gearset	Front Wheel	Rear Axle	Str'ng Knu'le	Str'ng Gear
250	Overland	60	114	34x4	34x4	½ El	¾ El	I B	Cone	A & I	Sel	3	R A	Shaft	T T	Semi-F	Int	Ext	Plain	5	Ball	Roller	Roller	Plain	B & P
251	Overland	61	118	34x4	34x4	"	"	"	"	"	"	3	"	"	"	Float	"	"	"	5	"	"	"	"	"
252	Packard	18 Runabout	108	34x4	34x4	"	½ El	Tube	M D	F & S	Prog	3	"	"	R R	Semi-F	Ext	Int	"	3	"	"	Ball	Ball	Plain
253	Packard	18 Standard	112	34x4	34x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
254	Packard	30 Runabout	114	36x4½	37x5	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
255	Packard	30 Standard	123½	36x4½	37x5	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
256	Packard	30 Phaeton	129½	36x4½	37x5	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
257	Packard	6 Runabout	121½	36x4½	37x5	"	"	"	"	"	"	3	"	"	"	"	"	"	"	4	"	"	"	"	"
258	Packard	6 Standard	133	36x4½	37x5	"	"	"	"	"	"	3	"	"	"	"	"	"	"	4	"	"	"	"	"
259	Packard	6 Phaeton	139	36x4½	37x5	"	"	"	"	"	"	3	"	"	"	"	"	"	"	4	"	"	"	"	"
260	Paige	Beverly	104	32x3½	32x3½	"	El	I B	"	Steel	Sel	3	U M	"	T T	"	....	....	"	2	B & Rl	Ball	B & Rl	Plain	"
261	Palmer-Singer	6-40	126	34x4	34x4	"	¾ El	"	"	S & R	"	3	R A	"	"	"	....	....	"	3	Ball	"	"	"	"
262	Palmer-Singer	46	126	36x4	36x4½	"	½ El	"	"	Steel	"	4	"	"	R R	Float	....	....	"	3	"	"	Roller	"	"
263	Palmer-Singer	6-60	138	36x4	36x5	"	"	"	"	"	"	4	Amid	"	"	"	....	....	"	4	"	Roller	Ball	"	"
264	Parry (see New Parry) Paterson	35	108	32x3½	32x3½	"	El	"	Cone	Leath	"	3	U M	"	TT&RR	Semi-F	Ext	Int	"	3	"	Ball	Roller	"	Ball
265	Paterson	45	120	36x4	36x4	"	¾ El	"	"	"	"	3	"	"	T T	Float	"	"	"	3	"	"	"	Ball	"
266	Pathfinder	40	118	34x..	34x..	"	½ El	"	"	"	"	3	"	"	"	"	Int	"	"	3	"	"	Ball	Plain	Plain
267	Peerless	D	113	34x4½	34x4½	"	"	"	Exp	L & A	"	4	Amid	"	"	"	Ext	"	"	3	"	Roller	"	Ball	Ball
268	Peerless	J	125	36x4½	36x4½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	7	"	"	"	"	"
269	Peerless	H	124½	36x4½	37x5	"	"	"	"	"	"	4	"	"	R R	"	"	"	"	3	"	"	"	"	"
270	Peerless	K	137	36x4½	37x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	7	"	"	"	"	"
271	Peerless	L	140	37x5	38x5½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
272	Penn	RF & T4	105	32x3½	32x3½	"	¾ El	"	Cone	Leath	"	3	"	"	"	Semi-F	"	"	"	2	Plain	"	Roller	"	"
273	Penn	TR-T5	115	34x3½	34x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	2	Ball	Ball	"	"	"
274	Petrel	25-35	98	32x3	33x3½	"	¾ El	"	....	....	Frict	....	"	Chain	"	Dead	Int	"	"	3	Plain	"	Ball	Plain	Plain
275	Petrel	45-55-65-75	115	34x3½	34x3½	"	½ El	Tube	....	....	"	....	"	"	"	"	Trans	Ext	"	3	"	"	"	"	"
276	Pickard	....	104	32x3½	32x3½	El	El	I B	Cone	Leath	Sel	3	"	Shaft	T T	Semi-F	Int	"	"	3	"	"	"	"	"
277	Pierce-Arrow	36-R	119	36x4½	36x4½	½ El	¾ El	"	"	"	"	4	"	"	Springs	"	"	"	"	7	Ball	Roller	B & Rl	"	B & Pl
278	Pierce-Arrow	36-T	127½	36x4½	36x4½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	7	"	"	"	"	"
279	Pierce-Arrow	48-R	128	36x4½	36x4½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	7	"	"	"	"	"
280	Pierce-Arrow	48-T	134½	37x5	37x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	7	"	"	"	"	"
281	Pierce-Arrow	66-R	133½	37x5	37x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	7	"	"	"	"	"
282	Pierce-Arrow	66-T	140	37x5	38x5½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	7	"	"	"	"	"
283	Pilot	40	120	36x4	36x4	"	½ El	"	"	"	"	3	U M	"	....	"	....	....	"	3	"	Ball	Ball	Ball	Plain
284	Pope-Hartford	27	124	36x4½	36x4½	"	¾ El	"	"	"	"	4	Amid	"	T&RR	Float	Ext	Int	"	3	Plain	Roller	P & Rl	Roller	Roller
285	Pope-Hartford	28	134	38x4½	39x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
286	Pratt	40	120	36x4	36x4	"	"	Chan	"	A & S	"	3	U M	"	TT&RR	"	Int	"	"	3	B & Rl	Ball	Ball	Plain	Plain
287	Premier	M-4	126	36x4½	36x4½	"	"	I B	M D	S & C	"	3	Amid	"	Springs	Semi-F	"	Ext	"	3	Ball	Roller	B & Rl	B & Pl	Roller
288	Premier	M-6	140	36x4½	36x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
289	Pullman	4-30	118	34x4	34x4	"	"	"	Cone	L & I	"	3	"	"	T T	Float	Ext	Int	"	3	"	Ball	Ball	Plain	B & Pl
290	Pullman	4-40	122	36x4	36x4	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
291	Pullman	6-60	136	36x4½	36x4½	"	"	"	"	"	"	4	"	"	"	"	"	"	"	4	"	"	"	"	"
292	Rambler	Cross Country	120	36x4	36x4	"	"	"	Exp	"	"	3	"	"	TT&RR	Semi-F	"	"	"	3	Roller	Roller	Roller	Roller	Ball
293	Rambler	Country Club	120	36x4½	36x4½	"	7-8 El	Tube	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
294	Rambler	Moraine	128	40x4½	40x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
295	Rambler	Metropolitan	128	40x4½	40x4½	"	¾ El	I B	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
296	Rayfield	C	117	34x..	34x..	"	"	"	M D	S & R	"	3	U M	"	R R	Float	"	"	"	4	Ball	Ball	Ball	Ball	Plain
297	R. C. H.	Runabout	86	30x3	30x3	"	El	"	Cone	A & I	"	3	R A	"	T T	Semi-F	"	"	"	2	P & Rl	"	B & Rl	Plain	"
298	R. C. H.	Touring	110	31x3½	31x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	2	"	"	"	"	"
299	Reading	40	122	36x4½	36x4½	El	"	"	"	L & I	"	3	Amid	"	T R	Float	"	"	"	5	Plain	Roller	Roller	"	"
300	Regal	N	100	32x3½	32x3½	½ El	½ El	"	"	"	"	3	R A	"	T T	Semi-F	....	....	"	2	Roller	Ball	"	"	"
301	Regal	L	109	32x3½	32x3½	"	El	"	"	....	"	3	"	"	R R	"	....	....	"	3	"	"	"	"	"
302	Regal	H	118	34x4	34x4	"	¾ El	"	"	"	"	3	"	"	"	"	....	....	"	3	"	"	"	"	"
303	Reo	Fifth	112	34x3½	34x3½	"	¾ El	"	M D	F & S	"	3	Amid	"	Springs	"	Ext	Int	"	3	"	Roller	"	"	"
304	Republic	111-112-113	120	36x4	36x4	"	"	"	Cone	Leath	"	3	R A	"	R R	Float	....	....	"	3	Ball	Ball	Ball	Ball	"
305	Richmond	N	106	32x3½	32x3½	"	"	"	"	"	"	3	Amid	"	....	Semi-F	Int	Int	"	5	"	Roller	"	....	"
306	Richmond	M	112	34x4	34x4	"	"	"	"	"	"	3	"	"	....	"	"	"	"	5	"	"	"	....	"
307	Ritter	1912	90	30x3	30x3	"	"	"	"	Steel	"	2	U M	"	T T	"	....	....	"	3	....	....	....	....	....
308	Roader	20	105	..x3	..x3	"	El	Tube	"	"	"	2	R A	"	....	"	Ext	Int	"	2	....	....	Ball	....	....
309	Rogers	C	90	36x1½	36x1½	Cross	"	I B	....	....	Frict	....	Amid	Chain	R R	Dead	Int	....	"	2	Ball	Roller	Roller	Plain	Plain
310	Schacht	B	103	32x3½	32x3½	½ El	El	Solid	Cone	Ther	....	2	Jacksh	"	....	"	"	....	"	2	Plain	"	"	....	"
311	Schacht	G-F	120	34x4	34x4	"	¾ El	IB	"	L & S	Sel	3	Amid	Shaft	T R	Semi-F	Ext	Int	"	2	Roller	Ball	B & Rl	Plain	Ball

Note—Abbreviations: Clutch: M. D., multiple disk; Con., contracting band; Exp., expanding band. Friction surface: Lin., linobestos; Ther., thermoid; A., asbestos; F., fiber; B., bronze; Leath., leather; S., steel. Gearset location: Amid., amidship; U. M., in unit with the motor; R. A., on the rear axle. Drive: Worm, shaft with worm gear. Car drives through: T. T., torsion tube; R. R., radius rod; T. R., torsion rods; S., springs. Brakes: Int., internal expanding on rear hubs; Ext., external contracting on rear hubs; Trans., on transmission. Front Axle: I. B., I-beam; Chan., channel. Springs: El., elliptic.

Motor Specifications of Pleasure Cars Made by American Manufacturers for the Season of 1912

Table No.	NAME OF CAR	CHASSIS MODEL	No. of Cylinders	Bore	Stroke	S. A. E. H. P.	Piston Disp.	Cyl. Type	Cylinders How Cast	Valve Location	COOLING		IGNITION			CARBURETER		Motor Lubrication
											Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed	
312	Schlosser	1912	4	5.00	6.00	40.0	471.2	T-Head	Pairs	Opposite	Pump	Cell	Dual	Bosch	Hand	G & A	Pressure	Forced
313	Sebring	6	6	3.56	4.00	37.2	238.3	I-Type	"	Head	"	"	"	Optional	"	Stromberg	Gravity	"
314	Selden	47	4	4.75	5.00	36.1	354.4	L-Head	"	Lt. Side	"	Tube	Double	Bosch	"	"	"	Splash
315	S. G. V.	A	4	3.75	4.38	22.5	193.3	"	En Bloc	"	"	Cell	Single	"	Fixed	Own	"	"
316	S. G. V.	D	4	4.00	5.25	25.6	263.9	"	"	"	"	"	"	"	.....	"	"	"
317	Shelby	40	4	4.13	5.25	27.4	280.6	"	Separate	Side	"	Tube	Dual	Remy	Hand	Schebler	"	.....
318	Simplex	38	4	4.88	6.50	38.0	485.3	T-Head	Pairs	Opposite	"	"	Single	Mea	"	Own	Pressure	Forced
319	Simplex	38	4	4.88	6.50	38.0	485.3	"	"	"	"	"	"	"	"	"	"	"
320	Simplex	50	4	5.75	5.75	53.0	597.2	"	"	"	"	"	"	Bosch	"	"	"	"
321	Simplex	50	4	5.75	5.75	53.0	597.2	"	"	"	"	"	"	"	"	"	"	"
322	Simplex	50	4	5.75	5.75	53.0	597.2	"	"	"	"	"	"	"	"	"	"	"
323	Spaulding	CP	4	4.00	4.00	25.6	201.1	L-Head	"	Lt. Side	"	Cell	Dual	Remy	"	Schebler	Gravity	Splash
324	Spaulding	E	4	4.13	5.25	27.3	280.6	"	Separate	"	"	"	Double	"	"	"	"	"
325	Speedwell	12	4	5.00	5.00	40.0	392.7	"	Pairs	"	"	"	Dual	Bosch	"	"	"	"
326	Spoerer	25-A	4	4.13	5.50	27.3	294.0	"	"	Rt. Side	"	"	"	"	"	G & A	"	Forced
327	Spoerer	40-C	4	4.88	5.50	38.0	410.6	T-Head	"	Opposite	"	"	"	"	"	"	Pressure	"
328	Stafford	.....	4	4.13	4.63	27.3	247.2	I-Type	"	Head	"	Tube	"	"	"	Stromberg	Gravity	"
329	Staver	35-B	4	4.38	5.00	30.6	300.7	T-Head	En Bloc	Opposite	"	Cell	"	Splitdorf	"	Schebler	"	Splash
330	Staver	35-F	4	4.50	5.00	32.4	318.1	"	"	"	"	"	"	Simms	"	"	"	"
331	Staver	40-F	4	4.50	5.00	32.4	318.1	"	"	"	"	"	"	"	"	"	"	"
332	Staver	40-RR	4	4.50	5.00	32.4	318.1	"	"	"	"	"	"	"	"	"	Pressure	"
333	Stearns-Knight	Runabout	4	4.25	5.50	28.9	312.0	Sleeve	Pairs	In Sleeve	"	"	"	Bosch	"	Own	"	"
334	Stearns-Knight	Regular	4	4.25	5.50	28.9	312.0	"	"	"	"	"	"	"	"	"	"	"
335	Stevens-Duryea	X	4	4.75	4.50	36.1	319.0	L-Head	"	Lt. Side	"	"	Double	"	"	"	Gravity	"
336	Stevens-Duryea	AA	6	4.25	4.75	43.8	404.1	"	"	"	"	"	"	"	"	"	"	"
337	Stevens-Duryea	Y	6	4.75	4.50	54.1	478.5	"	"	"	"	"	"	"	"	"	"	"
338	Stoddard-Day	Savoy	4	4.00	4.50	25.6	226.2	'	En Bloc	Side	Thermal	"	Dual	.....	"	Stromberg	"	"
339	Stoddard-Day	Stratford	4	4.50	5.13	27.3	290.7	"	Pairs	"	"	"	"	Bosch	"	"	"	"
340	Staddord-Day	Saybrook	4	4.75	5.00	36.1	354.4	I-Type	"	Head	Pump	"	Double	"	"	"	Pressure	Forced
341	Stoddard-Day	Special	4	5.00	5.50	40.0	431.9	"	"	"	"	"	"	"	"	"	"	"
342	Stoddard-Day	Special	4	5.00	5.50	40.0	431.9	"	"	"	"	"	"	"	"	"	"	"
343	Stoddard-Day	Knight	6	4.50	5.50	48.6	349.9	Sleeve	Threes	In Sleeve	"	"	"	"	"	"	"	Splash
344	Stutz	A	4	4.75	5.50	36.1	389.9	T-Head	Pairs	Opposite	"	"	Dual	Eisemann	"	Schebler	Gravity	Forced
345	Stuyvesant	50	4	4.88	6.00	38.0	448.0	"	"	"	Thermal	"	Double	Bosch	"	Stromberg	Pressure	"
346	Suburban	Limited	6	3.50	4.50	29.4	259.8	L-Head	"	Lt. Side	"	"	Dual	Simms	"	G & A	Gravity	Splash
347	Thomas	6-40	6	4.25	5.50	43.8	468.0	T-Head	"	Opposite	Pump	"	Double	Optional	"	Miller	Pressure	"
348	Triumph	.....	4	4.25	5.00	28.9	283.6	L-Head	"	Side	"	Tube	Dual	Splitdorf	"	Optional	Gravity	"
349	Union	3	4	3.63	4.00	20.3	165.1	I-Type	"	Head	Optional	"	Single	Simms	Fixed	Schebler	"	"
350	Velie	G	4	4.50	5.25	32.4	334.0	L-Head	"	Lt. Side	Pump	Cell	Double	Splitdorf	Hand	Stromberg	"	"
351	Velie	Standard	4	4.50	5.25	32.4	334.0	"	"	"	"	"	"	"	"	"	"	"
352	Velie	Special.	4	4.50	5.25	32.4	334.0	"	"	"	"	"	"	"	"	"	"	"
353	Virginian	A-50	4	5.00	5.00	40.0	392.7	"	"	"	"	Tube	Dual	Bosch	"	Schebler	"	"
354	Warren	12-30	4	4.00	4.50	25.6	226.2	"	En Bloc	Rt. Side	"	"	Single	"	Fixed	McCord	"	"
355	Warren	12-35	4	4.13	4.50	27.3	240.5	"	"	"	"	"	Double	"	Hand	"	"	"
356	Warren	12-40	4	4.25	4.75	28.9	269.4	"	"	Lt. Side	"	Cell	"	"	"	Stromberg	Pressure	"
357	Westcott	K-L-M	4	4.50	5.00	32.4	318.1	"	Separate	Side	"	"	Dual	"	"	Schebler	Gravity	"
358	Westcott	R	4	4.75	5.00	36.1	354.4	"	"	"	"	"	"	"	"	"	"	"
359	W. F. S.	B	4	4.50	5.50	32.4	349.9	"	Pairs	Lt. Side	"	"	Double	"	"	Rayfield	Pressure	"
360	White	GAD	4	3.75	5.13	22.5	226.4	"	En Bloc	Side	"	"	Single	"	.....	Own	Gravity	"
361	White	GB	4	3.75	5.13	22.5	226.4	"	"	"	"	"	"	"	.....	"	"	"
362	White	GE	4	4.75	5.13	36.1	363.3	"	"	"	"	"	"	"	.....	"	"	"
362	White	G F	6	4.25	5.75	43.8	489.4	"	"	Rt. Side	"	"	Single	Mea	Hand	"	"	"
363	Wilcox	35	4	4.25	5.00	28.9	283.6	"	Pairs	Side	"	Tube	"	"	"	Stromberg	"	"
364	Winton	17-C	6	4.50	5.00	48.6	477.2	"	"	Rt. Side	"	Cell	Dual	Optional	"	"	Pressure	"
365	Zimmerman	Z-40-R	4	4.31	5.00	33.0	292.1	"	"	Head	Thermal	"	"	Splitdorf	"	Schebler	Gravity	"
366	Zimmerman	Z-40-F	4	4.31	5.00	33.0	292.1	"	"	"	"	"	"	"	"	"	"	"
367	Amplex	H-K	4	5.06	5.00	.....	402.6	2-Cycle	"	.....	Pump	"	Double	Bosch	"	Own	Pressure	Forced
368	Amplex	Baby	4	4.50	4.50	.....	226.2	"	"	.....	"	"	Dual	"	"	"	"	"
369	Atlas	Knight	4	4.50	5.50	.....	427.6	Sleeve	"	In Sleeve	.....	.....	"	"	"	.....	.....	"
370	Atlas	Knight	4	4.50	5.50	.....	427.6	"	"	"	.....	.....	"	"	"	.....	.....	"
371	National	V-Touring	4	4.87	6.00	38.0	448.0	T-Head	"	Opposite	Pump	Cell	Double	"	"	Schebler	Pressure	Splash
372	National	V Roadster	4	4.87	6.00	38.0	448.0	"	"	"	"	"	"	Splitdorf	"	"	"	"
373	Standard	A	4	4.25	4.50	28.9	255.3	.....	"	.....	.....	.....	.....	.....	.....	.....	.....	.....
374	Correja	6	6	4.25	5.00	43.8	425.4	T-Head	"	.....	Pump	Cell	Dual	Simms	Hand	.....	.....	Splash

Note—Abbreviations: Thermal, thermo-syphon water circulation; Tu be., tubular radiator; Cell., cellular or honeycomb radiator.
Bore and stroke are given in decimals to the nearest 1-100th inch: a s, 4.50=4½, etc., .06=1-16, .13=⅛, .19=3-16, .25=¼, .31=5-16, .38=⅜, .44=7-16, .50=½, .56=9-16, .63=⅝, .69=11-16, .75=¾, .81=13-16, .88=⅞, .94=15-16, 1=1.00.

Bore and stroke are given in decimals .94=15-16, 1=1.06.

Transmission and Running Gear Specifications of American Pleasure Cars for the 1912 Season

Table No.	NAME OF CAR	CHASSIS MODEL	RUNNING GEAR								TRANSMISSION						BRAKES		BEARINGS						
									CLUTCH		GEARSET			Drive	Car Drives Thru	Rear Axle			Crankshaft		Gearset	Front Wheel	Rear Axle	Str'ng Knu'le	Str'ng Gear
			Wheel-base	Front Tires	Rear Tires	Front Springs	Rear Springs	Front Axle	Type	Friction Surface	Type	No. Spds	Loc.				Service	Em.	Type	No.					
312	Schlosser	1912	126	36x4½	36x4½	½ El	½ El	I B	M D	Steel	Sel	4	Amid	Shaft	R R	Float	Ext	Int	Plain	3	Ball	Roller	Roller	Roller	B & Pl
313	Sebring	6	122	36x4	36x4	"	"	"	"	"	"	3	U M	"	....	"	"	"	....	4	....	....	....	....	....	..
314	Selden	47	125	36x4	36x4	"	"	"	"	R & S	"	3	Amid	"	TR&S	"	Int	"	Plain	3	Roller	Ball	B & Rl	Plain &	BP
315	S. G. V.	A	116	34x4	34x4	"	"	Chan	"	Steel	"	4	"	"	Springs	Semi-F	Trans	....	"	3	Ball	"	Ball	B & Pl	Plain
316	S. G. V.	D	118	34x4	34x4	"	"	"	"	"	"	4	"	"	"	"	"	....	"	3	"	"	"	"	B & Pl
317	Shelby	40	120	36x3½	36x3½	"	"	I B	Cone	Leath	"	3	U M	"	T T	Float	Ext	Int	"	5	Roller	"	Roller	Ball	Ball
318	Simplex	38	127	36x4	36x5	"	"	"	M D	Steel	"	4	Amid	"	"	Semi-F	"	"	"	3	Ball	"	Ball	Plain	Roller
319	Simplex	38	137	34x4½	34x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
320	Simplex	50	124	36x4	36x5	"	½ El	"	"	"	"	4	"	Chain	R R	Dead	Trans	"	B & Pl	3	"	"	"	"	"
321	Simplex	50	129	36x4	36x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
322	Simplex	50	139	36x5	36x5	"	"	"	"	"	"	4	"	"	"	"	"	"	"	3	"	"	"	"	"
323	Spaulding	C-P	112	32x3½	32x3½	"	El	"	Cone	S & B	Plan	2	R A	Shaft	T R	Semi-F	....	....	Plain	5	Plain	"	Roller	"	B & Pl
324	Spaulding	E	117	34x..	34x..	"	¾ El	"	"	L & C	Sel	3	Amid	"	"	Float	....	....	"	5	Ball	Roller	"	"	"
325	Speedwell	12	121½	..x4½	..x4½	"	½ El	"	"	L & I	"	3	"	"	R R	"	Ext	Int	"	3	"	"	"	Roller	Plain
326	Spoerer	25-A	120	34x4	34x4	"	½ El	"	"	Leath	"	3	R A	"	T T	Semi-F	....	....	"	3	"	Ball	"	B & Pl	"
327	Spoerer	40-C	120	..x4	..x4½	"	"	"	"	"	"	3	Amid	"	R R	Float	Ext	Int	"	3	"	Roller	"	Plain	P & Rl
328	Stafford	....	112	34x4	34x4	"	"	"	M D	S & B	"	3	"	"	T T	Semi-F	"	....	"	3	"	"	"	"	Plain
329	Staver	35-B	112	34x4	34x4	"	El	Chan	"	Steel	"	3	"	"	R R	Float	....	....	"	3	"	Ball	Ball	"	"
330	Staver	35-F	120	36x4	36x4	"	¾ El	I B	"	"	"	3	"	"	"	"	....	....	"	3	"	"	B & Rl	"	"
331	Staver	40-F	124	36x4	36x4	"	El	"	"	"	"	3	"	"	"	"	....	....	"	3	"	"	Ball	"	"
332	Staver	40-RR	124	36x4	36x4	"	¾ El	"	"	"	"	3	"	"	"	"	....	....	"	3	"	"	B & Rl	"	"
333	Stearns-Knight	Runabout	116	36x4½	36x4½	"	"	"	"	S & R	"	3	R A	"	T T	"	....	....	"	5	"	Roller	Roller	"	Ball
334	Stearns-Knight	Regular	121	36x4½	36x4½	"	"	"	"	"	"	3	"	"	"	"	....	....	"	5	"	"	"	"	"
335	Stevens-Duryea	X	124	34x4	34x4	"	Plat	"	"	A & S	"	3	U M	"	"	"	Ext	Int	"	3	"	Ball	Ball	"	"
336	Stevens-Duryea	AA	128	36x4½	37x5	"	¾ El	"	"	"	"	3	"	"	"	"	"	"	"	4	"	Roller	"	Ball	"
337	Stevens-Duryea	Y	142	36x4	36x5	"	Plat	"	"	"	"	3	"	"	"	"	"	"	"	4	"	Ball	"	Plain	"
338	Stoddard-Dayton	Savoy	112	33x4	33x4	"	¾ El	"	Cone	L & I	"	3	R A	"	R R	Semi-F	"	"	"	3	Roller	Roller	B & Rl	"	"
339	Stoddard-Day	Stratford	114	36x4	36x4	"	"	"	"	"	"	3	"	"	"	Float	"	"	"	3	"	"	"	"	"
340	Stoddard-Day	Saybrook	122½	36x5	36x5	"	"	"	"	"	"	3	Amid	"	"	"	"	"	"	3	Ball	"	"	"	"
341	Stoddard-Day	Special	122½	36x4½	36x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
342	Stoddard-Day	Special	130	37x5½	37x5½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
343	Stoddard-Day	Knight	133	37x5½	37x5½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	7	"	"	"	"	"
344	Stutz	A	120	34x4½	34x4½	....	....	"	M D	Steel	"	3	R A	"	T T	Semi-F	Int	"	"	3	"	"	"	Roller	"
345	Stuyvesant	50	126	36x4½	36x4½	½ El	¾ El	"	Exp	A & S	"	4	U M	"	"	Float	Ext	"	"	3	"	Ball	Ball	Ball	"
346	Suburban	Limited	110	34x3½	34x3½	"	....	"	M D	S & R	"	3	"	"	TT&S	"	....	....	"	4	B & Rl	"	B & Rl	"	Plain
347	Thomas	6-40	134	36x4½	37x5	"	¾ El	"	"	C & S	"	3	Amid	"	T T	"	Ext	Int	"	4	Ball	Roller	Roller	Roller	Roller
348	Triumph	....	118	36x4	36x4	"	½ El	"	Exp	Leath	"	3	"	"	"	"	Int	Ext	....	..	....	....	....	....	....
349	Union	3	100	30x3	30x3	"	El	"	M D	Steel	"	3	U M	"	"	Semi-F	....	....	Plain	3	P & Rl	Ball	B & Rl	Ball	Plain
350	Velie	G	115	34x4	34x4	"	¾ El	"	"	S & B	"	3	Amid	"	Springs	Float	Ext	Int	"	3	Roller	Roller	Roller	Plain	Ball
351	Velie	Standard	118	36x4	36x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
352	Velie	Special	121	36x4½	36x4½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	3	"	"	"	Roller	"
353	Virginian	A-50	130	40x4½	40x4½	"	½ El	"	Cone	L & S	"	3	"	"	"	"	"	"	"	3	"	"	"	"	"
354	Warren	12-30	110	34x3½	34x3½	"	¾ El	"	"	L & I	"	3	"	"	"	Semi-F	"	"	"	2	Plain	Ball	B & Rl	Plain	Plain
355	Warren	12-35	112	34x3½	34x3½	"	"	"	"	"	"	3	"	"	"	"	"	"	"	2	"	"	"	"	"
356	Warren	12-40	116	34x4	34x4	"	"	"	"	"	"	3	"	"	"	Float	"	"	"	3	Ball	Roller	Ball	"	"
357	Westcott	K-L-M	120	36x4	36x4	"	½ El	"	"	"	"	3	"	"	"	"	"	"	"	5	Roller	"	Roller	"	B & Pl
358	Westcott	R	120	36x4	36x4	"	"	"	"	"	"	3	"	"	"	"	"	"	"	5	Ball	"	"	"	Plain
359	W. F. S.	B	118	36x4	36x4	"	Plat	"	C & D	Steel	"	3	R A	"	R R	"	Int	Ext	"	3	"	"	Ball	"	"
360	White	GAD	110	34x4	34x4	"	¾ El	"	Cone	Leath	"	4	Amid	"	....	Semi-F	Ext	Int	Ball	2	"	Ball	"	Ball	Ball
361	White	GB	120	34x4½	34x4½	"	"	"	"	"	"	4	"	"	....	"	"	"	"	2	"	"	"	"	"
362	White	GE	120	36x4½	36x4½	"	"	"	"	"	"	4	"	"	....	"	"	"	"	2	"	"	"	"	"
362-A	White	GF	132	37x5	37x5	"	"	"	"	"	"	4	"	"	....	"	"	"	B & P	3	"	"	"	"	"
363	Wilcox	35	115	..x3½	..x3½	"	"	"	M D	R & S	"	3	U M	"	T T	Semi-F	Int	Ext	Plain	3	Plain	Roller	Roller	Plain	"
364	Winton	17-C	130	36x4½	36x4½	"	"	"	"	Steel	"	4	Amid	"	R R	Float	Ext	Int	"	4	Ball	"	"	P & Rl	B & Pl
365	Zimmerman	Z-40-R	116	34x3½	34x3½	"	El	"	Cone	S & L	"	3	"	"	T T	"	"	"	"	3	Plain	Ball	"	Plain	Plain
366	Zimmerman	Z-40-F	116	35x4	35x4	"	"	"	"	"	"	3	"	"	"	"	Int	"	"	3	"	"	"	"	"
367	Amplex	H-K	128	36x4½	37x5	"	½ Ell	"	M D	S & I	"	3	R A	"	R R	Semi-F	....	....	"	5	Ball	Roller	Ball	Ball	"
368	Amplex	Baby	120	34x4	35x4½	"	½ Ell	"	"	C & S	"	3	....	"	T R	Float	Int	Int	"	5	"	B & R	B & R	....	B & Pl
369	Atlas	Silent-Knight	130	36x4½	36x4½	"	"	"	"	....	"	3	R A	Worm	T T	"	Ext	"	....	....	....	....	....	....	....
370	Atlas	Silent-Knight	140	37x5	37x5	"	"	"	"	....	"	3	"	"	"	"	"	"	....	....	....	....	....	....	....
371	National	V-Touring	128	36x4½	36x4½	"	"	"	Cone	I & S	"	3	Amid	Shaft	S&TR	"	Int	....	Plain	3	Ball	Roller	Roller	Roller	B & Pl
372	National	V-Roadster	120	34x4½	34x4½	"	"	"	"	"	"	3	"	"	"	"	"	Int	"	3	"	"	"	"	"
373	Standard	A	110	34x3½	40x3½	"	"	"	M D	....	"	3	....	....	....	"	....	....	"	....	"	....	Ball	....	....
374	Correja	....	125	36x4	36x4	....	"	"	Cone	Lea	"	3	R A	....	....	"	Ext	Int	....	....	Roller	....	....	....	....

Note—Abbreviations: Clutch: M. D., multiple disk; Con., contracting band; Exp., expanding band. Friction surface: Lin., linobestos; Ther., thermoid; A., asbestos; F., fiber; B., bronze; Leath., leather; S., steel. Gearset location: Amid., amidship; U. M., in unit with the motor; R. A., on the rear axle. Drive: Worm, shaft with worm gear. Car drives through: T. T., torsion tube; R. R., radius rod; T. R., torsion rods; S., springs. Brakes: Int., internal expanding on rear hubs; Ext., external contracting on rear hubs; Trans., on transmission. Front Axle: I. B., I-beam; Chan., channel. Springs: El., elliptic.

MOTOR AGE
Published Weekly by
THE CLASS JOURNAL COMPANY
910 South Michigan Avenue CHICAGO
NEW YORK OFFICE
239 West 39th Street
SUBSCRIPTION RATES
United States and Mexico
$3.00 per Year
Other Countries including
Canada $5.00
Entered as Second-Class Matter September 19, 1899, at the Postoffice at Chicago, Illinois, under Act of March 3, 1879

The Architects of Industry

THE ancient Egyptians, the builders of the pyramids, considered the pyramidal form an emblem of human life; the broad four-sided base signified the beginning and the termination of the four sides in a single point signified the end of existence in the present state. Nothing could better incorporate the broad concepts of life—a beginning of sufficient area to include the varied activities of humanity and a constant focusing of all of these activities, until the final end, when a point, indicating unity and harmony of activities, has been reached.

The narrowing from the base to the apex is representative of every individual life, of the life of every nation and of the varied industries that make up the commercial life of every epoch. Progress in the individual consists in working towards a goal. At the start direction of activity is almost an unknown factor. This is the primary stage—the base of the pyramid. First effort calls for analysis of the conflicting factors with the object of an ultimate goal. In the construction of the pyramid, rough and unorganized as the lower layers of masonry may have appeared, they nevertheless conformed to a well conceived plan. Each succeeding layers of rock was fashioned with the master hand, so that the culmination of the pile would be the central top, the apex. This final point of design was never out of mind, every stone was laid with reference to it, every task was in this direction, nothing became a part of the pyramid which was not in conformity with the ultimate goal—a conception of unity, typifying stability and permanency.

THE motor car industry some day will complete its pyramid as a stage in the evolution of this world. The work began three decades ago. The base measurements are but roughly determined today. A few second layers of masonry have been added, but there is not a complete layer in the structure. One side is apparently being reared in advance of the others. In some departments the elimination of the weak has left the field to the strong and the line of structure can be roughly traced.

SOME parts of the car have been delved into much deeper than others. Masonry in one field has been pushed apace while others have lagged. To the distant traveler the form is converging, a true pyramid; but on nearer view the observer is confused by the rough edges of the blocks of stone. In the words of Longfellow, the pyramids which appear in such perfect form in the distance are "upon nearer view but gigantic steps of stone."

THE pyramid of the motor car industry is similar. Each succeeding row of stone is but a step upwards—a narrowing of the base lines obtained by elimination of the proven weak. Layer after layer, the factory artisans and the company heads are laying, each one shorter to the side than the preceding one. Each layer is a heterogenous mass. At close vision it is disheartening—order seems exorcised, chaos rules alone. A real thread of development can scarcely be traced in ignition: The ideal of yesterday becomes the unsettled of today and the discarded of tomorrow. Fortunate will it be if the elimination process always is a correct one; fortunate if the discards of yesterday are not taken up as the gems of tomorrow; fortunate will it be if every step is well considered, if every stone placed in the pyramid is hewn to size and occupies a permanent place.

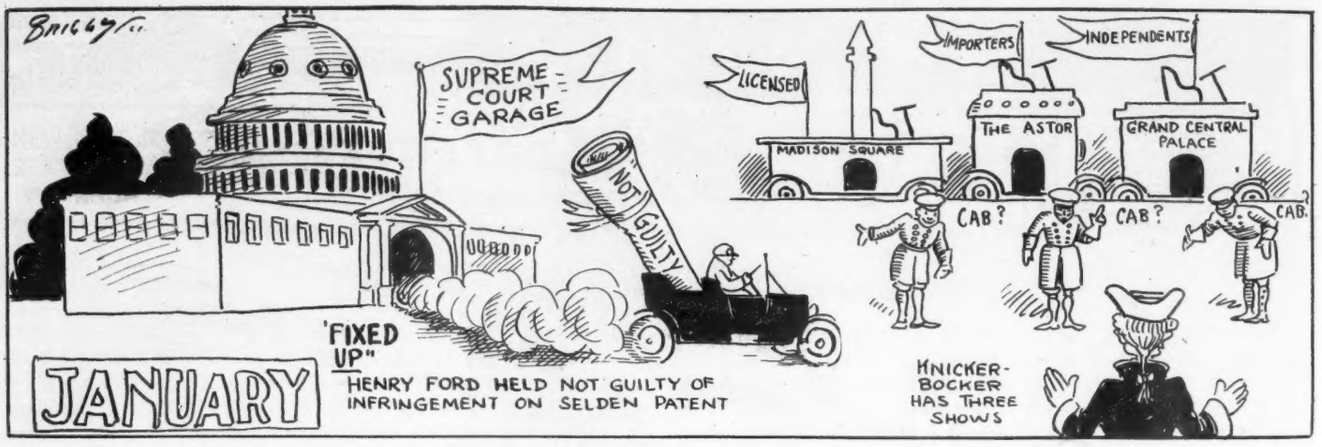
EACH side of the pyramid must be reared with reference to the completed whole. The apex will be the eventual car. What it is nobody today knows: Thousands have broad conceptions: The length and width of the present layers are broad enough for all the varied ideals. Each succeeding layer will narrow the space. Broad steps of progress have been made in the last 10 years in the many car departments, each succeeding stone is being fashioned with more care with a greater delicacy of touch. The rough sides grow smooth as the pyramid rears skyward. The crude tools of last year have given way to the finer ones of today, and these will sooner or later give place to the deft instruments of the future. The broad vague views of the engineer of 5 years ago have been succeeded by the more directed views of science of today. The bulky form of 1900 has been forgotten by the work of the present; the weighty masses of last century have gone and the reduced proportions of today are taking their place in the pyramidal pile. Lying on the rough basic blocks of 7 years ago are the more delicately chiseled cubes of today. In bearings, in steels, in wheels, in ignition, in carburetion, in lubrication and in other departments, is this so.

THE motor car pyramid is rearing. Some day it will have the apex stone positioned; the last word will have been said, history will have claimed its own. Until that time all must be good workmen, all must be honest workmen. It is not for every one to lay the corner stones; some labor on in the interior, carrying mortar—they never see the side line, they never lay a stone that takes its place in the side wall and eventually becomes one of the steps on which other workmen mount to higher levels. But their labor plays its part. The center is as necessary as the outside. While the skilled workmen are determining the angle of convergence at the apex, those who carry the material to the top, those who hew the blocks into cubes, and those who draw the corner lines must play their parts. All are architects in their field.

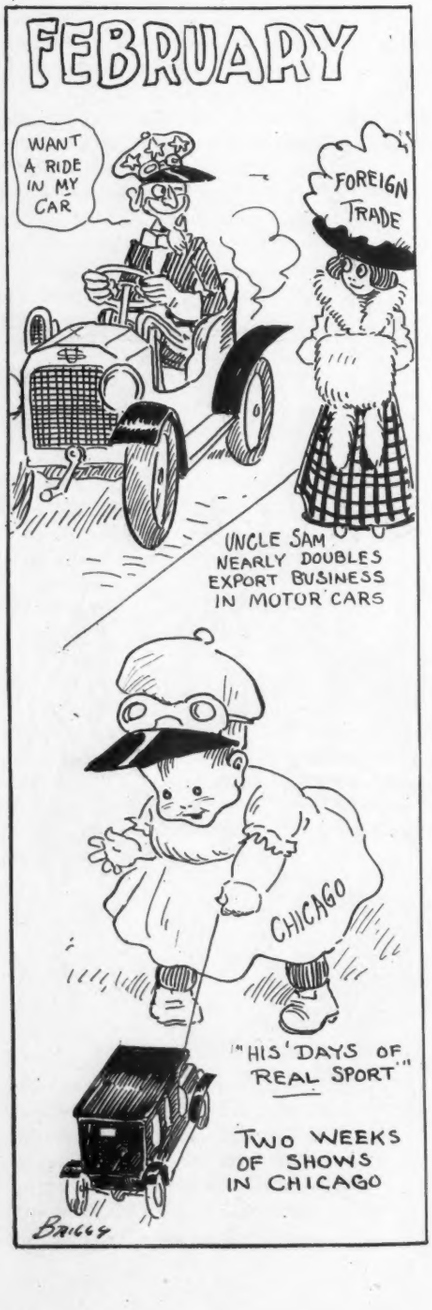
The artisan who fashions the drop forging to the demands of the hour and the conditions of the present is as good a workman as he who determines the crankshaft strength or the bearing area. Without either the ultimate car is an impossibility. The engineer, hidden in his obscure laboratory, who solves the problem of the carbureter jet is as good a builder as the consulting egineer who dictates the policy of a dozen factories. The artisan who bestows his best art in the smoke of the foundry is as great an essential as the student who tests the finished castings in the parlor-like laboratory.

THE motor car pyramid will be a great one. When historians, now unborn, pen the pages of this great epoch of transportation, each and all will be put in his proper niche. Only then will the real master workmen be seen in their full stature. Today, some who shoot meteor-like across the sky are but specters, marvels today but forgotten tomorrow. Many who command the salaries of 1912 will be unheard of in 1920. Elimination must continue. Each succeeding layer must be of shorter measurements: the apex must be reached, the right, the true must take the place of the weak, the temporary. One after one must fall. Others will take up the burden and push on. Master minds are needed to man the corners, to estimate the face stones, to hold the symmetry and oversee the work.

The Siege Is On!



Pictorial Review of the Year in Cartoon



Pioneer Car Manufacturer Discusses the Rotary-Valve Gasoline Engine and Tells of Some of Experiments with It.

BY ELWOOD HAYNES

President Haynes Automobile Co.

THE difficulty attending the manufacture of the so-called poppet valve for the gasoline engine is so well known that only a few comments on these may be deemed necessary. First, their manufacture was tedious and difficult, owing to the large number of parts necessary for their construction and operation. Second, owing to the rapid reciprocation and resulting hammer, the best material, treated in the most scientific manner, must be employed in their construction.

JANUARY

Licensed show held in Madison Square garden, the Independents in Grand Central palace and the importers in the Astor, New York.

Judge Noyes, of the second circuit, United States Circuit Court of Appeals, decides in Selden suit that Henry Ford is no infringer, although the patent itself is valid. Ford held not guilty of infringement because Selden patent was based on the Brayton two-cycle type, whereas the engine of common usage is of the Otto or four-cycle type.

Henry Souther succeeds Howard Coffin as president of the Society of Automobile Engineers.

United States Tire Co. is incorporated, being the Hartford Rubber Works Co., Morgan & Wright, G & J Tire Co. and the Continental Caoutchouc Co. with a holding company.

Manufacturers Contest Association elects Howard E. Coffin president.

FEBRUARY

Two weeks of shows in Chicago.

Pennsylvania Railroad sends out a good roads train for the purpose of educating the farmers as to the needs of improving highways so freight may be moved easier.

South Bend and Detroit interests of the Studebakers are merged, the Studebaker Corporation with $45,000,000 capitalization being the result.

Reports from Washington show that the export business in 1910 reached 8,440 cars, valued at $11,210,295, together with parts valued at $1,980,001, almost double the business of the calendar year 1909 when 4,686 cars were exported. Imports dropped to 1,024 cars, valued at $2,080,555.

Road racing season opens with the Oakland meet in which the winners are Bert Dingley in a Pope-Hartford, Charley Merz in a National and C. Bigelow in a Mercer.

Indeed, rapid reciprocating motion inevitably tends to the destruction of the moving parts in all classes of machinery. The force required to start and stop even a comparatively light piece of metal seldom is appreciated, even by persons of considerable mechanical experience. Furthermore, the destructive action on these parts is very greatly increased with the suddenness of starting or stopping the moving part. To add to the difficulty, there is a tendency to set up a clatter or noise which increases with the speed and multiplicity of valves, so that the finest adjustments become necessary, not only in the reciprocating parts themselves, but also in the timing gears which actuate them.

The poppet valve leaves its seat each time it acts, and thus leaves an opportunity for carbon and other solid substances to adhere to the valve seat, which in certain cases may prevent the valve from fully closing. This may subject the valve seat to the direct action of hot, compressed gas, which quickly results in erosion, and perhaps permanent injury to the valve. The sliding valve does not eliminate reciprocating motion, the valve does not leave its seat; second, it is capable of operating without noise. It is a notable fact that some of the oldest types of the Otto engine were equipped with valves of this description. The main reason, I believe, for their abandonment, was the difficulty in preventing leakage.

The rotary valve possesses none of these objectionable characteristics, though considerable amount of trial and experiment doubtless will be necessary before it is finally perfected. It was with a view to eliminating the difficulties caused by poppet valves that I constructed a rotary-valve motor in 1902-03. This valve was of a balanced type, with the bases facing each other. The revolving portion of the valve was constructed in one piece, the axle of rotation consisting of a shaft about ¾-inch in diameter. The bases of the

Pertinent Topics Discussed by Experts

cones were separated by a space about ¼-inch in width, and this space constituted a portion of the explosion chamber. This valve was placed in one cylinder of a double-opposed horizontal engine, the other piston being allowed to run idle. The valve seats in the cylinder were water-jacketed, and lubricated by small compression grease cups operated by a spring and piston. The valve was revolved by means of a pair of 2 to 1 timing gears, one of which was placed on the engine shaft, and the other on a shaft directly coupled to the axis of the valve.

The engine started without trouble, and it is needless to state that that valve operated without the slightest noise. In fact, no noise was made by the bevel gears since, owing to the balanced feature of the valve, there was no catch at the time of explosion, and everything worked with absolute smoothness. It was noticed, however, that noises which were not before apparent in the carbureter now became quite pronounced. By making certain adjustments and changes, these noises were practically eliminated. It then was noticed that quite a considerable amount of noise was made by the idle cylinder, owing to the in-rush and out-go of air through a large hole, from which the cylinder plug had been removed. This hole then was plugged, and this source of noise eliminated, after which the engine became practically silent in its operation. The only noise which I remember was that of the exhaust gas passing into the manifold when the valve opened, and one had to listen carefully to hear even this.

The engine was run for several days for about 10 continuous hours each day, when the valve was removed and carefully examined. It showed not the slightest wear, and no evidence whatever of leakage. By the use of a silent chain drive, all risk of noise or risk from gearing can be avoided. The valves can be operated practically from a single shaft, and the total number of working parts reduced.

Amateur Contests Should Be Encouraged, E. C. Brown Thinks—Chicago's Interclub Team Match An Example

BY EVERETT C. BROWN
Ex-President Amateur Athletic Union

ALTHOUGH the Chicago Athletic Association is the recognized leader in the west in all amateur athletics, the only sport in which members of the club actually take part as active contestants is the reliability runs in which the Chicago Automobile Club annually meets the Chicago Athletic Association. The fifth of these contests was held last June, and from the experience of having participated in these contests, I know I speak advisedly when I state that in each succeeding year the

MARCH

France awards old-age medal to a 4-horsepower Panhard, in service since December 4, 1891.

Napier car is awarded the Dewar trophy by the Royal Automobile Club of Great Britain for a high-gear run from London to Edinburgh and back.

Net earnings of United States Motor Co. for fiscal year ending July 31, 1910, announced to be $2,641,050.

Tetzlaff, Lozier, defeats de Palma, Fiat, in 100-mile match race on Los Angeles speedway, breaking 25, 50, 75 and 100-mile records.

Beach meet is held at Jacksonville, Fla., in which Wilcox, Disbrow and Burman break records.

APRIL

Lozier company takes possession of its new Detroit plant.

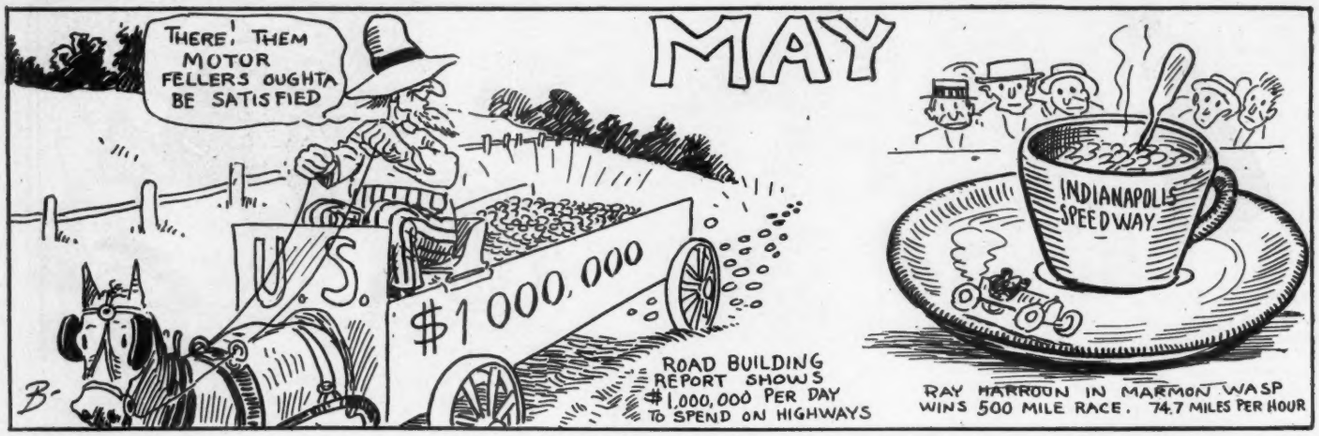
Fiat creates a new 24-hour speedway record at Los Angeles, traveling 1,491 miles.

Exit the Association of Licensed Automobile Manufacturers; enter the Automobile Board of Trade.

United States census bureau discovers that in 1909 the American motor industry manufactured products valued at $194,722,600, an increase of 4,001 per cent in 10 years, and made 127,289 cars valued at $165,115,000.

Bob Burman in the Blitzen Benz breaks the world's straightway records for 1 kilometer, 1 mile and 2 miles at Daytona, the times being :15.88, :25.40 and :51.28, mile mark being the equivalent of 141.173 miles per hour.

Bert Dingley in a Pope-Hartford, wins the longest hill-climb of the year, making 15.7-mile climb at Redlands, Cal., at the rate of 50.4 miles per hour.



contest is better, the entries larger, the brand of sportsmanship exhibited not only the best with which I ever have come in contact, but an example to contestants in every branch of sport the country over. Above all, the spirit of good-fellowship is so much in evidence that at times the desire to win on the part of each team is well-nigh forgotten. I never have seen anything in sport where the same feeling of camaraderie prevails.

I feel that I can say, without fear of contradiction, that there is nothing in the nature of motoring competition throughout the United States that awakens the keen interest among the manufacturers that this contest does. It is one of the very few amateur motoring events of absolutely the first class, and every car is tuned up to perfection, both the owner of the car and the manufacturer vieing with each other in their desire that each car shall start in this match in an absolutely perfect condition. I honestly believe that the manufacturer would rather have a car of his make go through this event with a perfect score than to win many of the professional road races.

From the day the first pathfinding car starts out to determine which route will be chosen, up to the time the last car passes the finish line, the entire membership of both clubs exhibit the keenest interest in the plans, and the final outcome of the event. The newspapers, alive to this fact, print columns covering every detail, and the general public knowing that these annual events are purely a gentlemen's contest, exhibit a healthy interest.

All of the officials are men of long experience, and their orders, decisions and penalizations are accepted without question. If all of the other pleasant features of the event were eliminated, this exhibition of sportsmanship on the part of all of the competitors would well repay everybody interested in the event, and shows perhaps better than anything else the character of the entrants. The boards of governors of both of these great clubs will make a grave mistake if they do not continue to encourage these annual contests in every way within their power, for they are well worth the while.

Makers Support Stock Car Principle

Lozier, Abbott-Detroit and National Representatives Believe the American Buying Public Wants Contests in Which the Contesting Machines Are Up to Catalog Specifications

BY H. A. LOZIER
President Lozier Motor Co.

THOSE who are interested in motor car racing, purely as a sport, must view with regret the tendency in the past 2 years to get away from strictly stock car competition. The manufacturer who has taken part principally with the idea of developing his product and eliminating weaknesses, does not, at the same time, desire to be an also ran in contests with cars from which all restrictions have been removed.

No matter how impressive his performance might be to those who know, the public looks upon the good stock car which does not win as something which, for some unknown reason, must be inferior to the winner. Unrestricted contests mean nothing to the thoughtful man who desires to purchase a car, and the performances of special cars mean nothing to the manufacturer, and do not help him very much, if any, in the way of improving his stock motor cars.

When interest in racing was at its height 8 to 10 years ago, there were practically no stock cars. All manufacturers were seeking to know the best standard of construction. Racing quickly developed the type which is in universal use today, and it has been improved only in detail. The early racing did more to develop the production of high-class steels than anything else in the motor or any other industry. The European firms which took part in racing years ago were the first to build good cars as a result. As soon as their cars became reliable and approached perfection, the decline of racing in Europe began. A few years later the Americans began to run their speed and reliability contests with stock cars, and for a long time the interest in those contests was widespread. In our opinion, the greatest factor in making American cars the equal, at least, in all respects, of those made abroad, was 24-hour contests between stock cars and long-distance stock car road races in which all of these strong points were brought out.

It was found, however, that in every class one or two logical winners were developed, and some manufacturers whose regular cars were not able to win consistently in these contests desired to build special cars in order to show among the winners. Promoters found it difficult to procure entries for stock car contests, and during the past season all the big events, with the exception of the Elgin road races, were practically unrestricted as to type of car, being limited only in some cases in piston displacement.

The result has been that a considerable number of manufacturers have withdrawn their support from racing. Some promoters have shown a tendency to recruit cars from the ranks of individuals or from manufacturers who have built special racing machines utterly different from their regular product and have put them in motoring contests.

I believe that contests in this country will cease to attract public interest until a revival of stock car racing can be brought about. European makers have learned this lesson, and in the past 2 years their contests, which have been most successful, have been among cars which, in all the more important details, have been restricted to stock specifications as they are cataloged.

We believe that there is still room for improvement in design, and regret that the opportunity to try out new stock models will be lost unless stock car racing can be revived. There is no form of contest which so quickly brings to the surface imperfections in design and material as these stock car events.

STOCK CAR IS SPORT'S BASIS

National Events Threatened if Better Support Is Not Given Them

BY B. C. SPITZLEY

Assistant General Manager Abbott Motor Co.

THE Abbott Motor Co. thoroughly believes that if national contests, such as the Elgin, Fairmount Park, Vanderbilt grand prize and Santa Monica road races and others of like prominence, do not get down to the basis of stock car events, interest, in so far as car manufacturers are concerned, will die out entirely so far as this country is concerned.

Primarily the proposition of contest work, as the writer understands it, was for the purpose of thoroughly demonstrating to the public the durability of the stock product rather than a special creation built for the purpose of speed, endurance, etc., such as is raced by some concerns in this country.

The motor car purchasing public is not composed of novices, and knows full well the difference between stock and special product; in fact, this is one of the first questions owners investigate when they attend contests of any nature. Everybody knows quite well that it is possible to spend an unlimited amount of money and succeed in building something better in the way of a speed creation than has ever been attempted before. It is not necessary for manufacturers to undertake a proposition of this kind to carry it off successfully as has been more than once demonstrated.

We believe, with the assistance of a man with considerable motor race experience, that any machine shop of proper equipment and proportions could develop a car for speed purposes that would equal in every way the product which any car factory could possibly manufacture. This, however, would not demonstrate to the public what it is anxious to know; that is—whether or not this same concern could go into the manufacture of a quantity of these cars during the year as a stock proposition and be successful in manufacturing a car at a price that could be termed—a first class article.

The knowledge the buyers are anxious to have is—whether or not this or that make of car, as a stock proposition, is a good investment for them, and we never will be able to enlighten them on this subject in a more satisfactory manner than we could, providing we adhered closely to stock car contests in all national events in the future.

We believe that all people who are desirous of witnessing motor car races for the sole purpose of viewing speed creations can have their appetite absolutely satisfied through the events that are handled by promoters and professionals at state fair meets, etc., and further that the growing demand of the motor public at large which has to do with the success of the industry is for stock car events such as the ones at Elgin.

We feel quite positive that if motor car racing gets back to this basis firmly, a great many more manufacturers of first class cars will be willing to participate in the future and that the sport will profit accordingly.

MAY

National racing circuit scheme is abandoned.

Report made by Logan Waller Page, director of the official public roads of the department of agriculture, shows that during the road-building season of 1911. $1,000,000 a day would be spent on American highways.

New sort of record made. Bob Burman drives ½ mile on Long Island motor parkway in :22 2-5, 80 miles an hour, at midnight with only electric headlight for illumination.

Ray Harroun in Marmon Wasp, wins 500-mile race on Indianapolis speedway at rate of 74.7 miles per hour. Forty cars start, twelve finish and 80,000 persons see the race.

Brush runabout wins free-for-all prize in Chicago economy test; Moline, Grout and Rayfield win in other classes.

JUNE

Celrano in a S. C. A. T. wins the Targa Florio cup race in Sicily.

Glidden tour from Washington, D. C., to Ottawa postponed because of lack of entries.

Algonquin cup in Chicago hill-climb is won by Eddie Hearne in a Benz.

England's first stock car race is won on the Brooklands speedway, the winner being a 15.9-horsepower Star which averages 56.7 miles per hour for 277 miles.

President Taft joins the Touring Club of America.

France's light-car race at Boulogne brings out thirty-eight starters, first six to finish being of French construction. First place to the Delage at 55.1 miles per hour.

Premier suit against A. A. A. over Glidden tour decision is dismissed by a New York court.

SEES GOOD IN BOTH STYLES

National Likes Stock Car Racing and Free-for-alls, but Prefers Former

BY GEORGE M. DICKSON

Secretary-Treasurer National Motor Vehicle Co.

I AM a firm believer in stock car contests of all kinds, in preference to class C or free-for-all events. I think class C and free-for-all events should not be entirely eliminated by any means, but I believe stock car contests should be liberally supported by all manufacturers.

We have been unusually active in all sorts of contest work during the past two seasons and I believe I am in a position to judge as to the relative merits of the different classes of contests; however, my judgment in the matter is not biased by an unusual amount of success in any one particular class, as our National winnings for the past two seasons have been very thoroughly distributed through all classes of contests.

I believe the stock car contest offers as many attractions for the public as any other form of contest, for when you analyze a race meet to find out what it is that attracts the people you will observe that the manufacturer enters his car because the public will witness and read about the race; because it provides a severe test for his product. The public will attend the race and read about it, because they enjoy the holiday spirit and good times associated with the meet; the vacation; the thrill and excitement of sportsmanship, and quite frequently the touring to the meet, to say nothing of the human quality of loving stiff competition and a good winner.

A stock car event affords all the above attractions, and I believe the motor-riding public as a whole would prefer to see duplicates of the cars they drive in competition rather than to see special-made machines, such as are eligible in events other than stock car events.

However, if there are but a limited number of manufacturers who will compete in stock car events, as has been the case in many instances in the past, the personal interest in the stock car event cannot be so general because there is not

JULY

Herrick in a National wins the Bakersfield road race.

Party of Premier owners start from Atlantic City on the famous ocean-to-ocean tour.

Illinois passes new motor law which puts into force annual registration with the fee based on horsepower.

Missouri formally adopts a state highway, which is laid out by Governor Hadley.

Hoosiers participate in a four-state tour which is unique in that it is a commercial demonstration, not a contest.

Team match for Prince Henry trophy between English and German amateurs is won by the British.

Hemery in a Fiat wins so-called French grand prix road race.

Imperial winner of annual Wisconsin state reliability tour.

New York fire department decides to oust horses and instal motor fire-fighting apparatus instead.

Marmon and Flanders trophy winners in Minnesota State Automobile Association tour from St. Paul to Helena, Mont.

enough warm competition in that division.

Speaking from our own angle I can say that National owners have demonstrated a personal and fraternal pride in seeing National cars compete in stock car events. The owner of one of our cars, sitting behind a wheel at the side of a course, has a personal interest in a stock event in which a National competes. He becomes very enthusiastic about the position of his make of car in the race, as he realizes that it is identical with the one he drives, and it certainly means more to him to have a stock car win a race than it does to have some specially constructed machine, which in reality bears little or no relation to the product of the factory that car represents. It is that sort of enthusiasm that helps motoring.

If the great majority of American manufacturers would support stock car racing instead of endeavoring to discredit it, this feeling of personal pride in the competing cars would be decidedly more general, and once the public becomes thoroughly familiar with the meaning of stock car contests and understands, as we understand, that the stock car competing in stock car events, under the existing rules of the A. A. A., is an exact reproduction of the car the consumer buys, the interest will be greater in stock car events than in any other form of contests.

It is unfortunate that a few manufacturers have by inference caused a portion of the public to believe that stock car racing is not clean and above board. I think this impression does not prevail generally, but we hear entirely too much of it when stock car contests are mentioned in the columns of the newspapers.

I can say from our own experience that we have found the existing rules to be absolutely fair and impartial and have not found it at all difficult to live within those rules as they are laid down by the A. A. A. and administered by the technical committee of the American Automobile Association.

I feel that we really get more benefit from our stock victories than we do from all of our other victories, and I believe it is due the buying public that the manufacturer who enters the racing field should compete with his car in a certain number of stock events when the opportunity presents, in order to prove the sort of car he is delivering to his customer, and I should be very sorry indeed to see stock car racing discontinued for the season of 1912.

I appreciate the fact that there is an apparent lack of interest on the part of numerous manufacturers, as far as stock car events are concerned, but speaking for the National Motor Vehicle Co., I can assure the public that we are heartily in favor of stock car events in the future, as we have been in the past, and we hope there will be enough other manufacturers who will take this same view of the situation to insure a reasonable number of good stock car contests through the coming season.

I believe the public is gradually becoming more familiar with the meaning of a stock car contest, and if it can be made to understand how thoroughly the technical committee of the A. A. A. has done its work during the past season in stock car events it will be still more interested in that class of contest.

I certainly hope that the Chicago Motor Club and the Elgin Road Racing Association will stand by their guns and make the next Elgin races stock events in 1912, as in the past. By so doing the club will get the support of those makers who believe in stock car racing, which is more than sufficient to make the meet a success as has been demonstrated in the past, for Elgin always has a good entry list.

AUGUST

Glidden tour from Washington, D. C., to Ottawa, Ont., abandoned and a good roads tour from New York to Jacksonville, Fla., in October substituted.

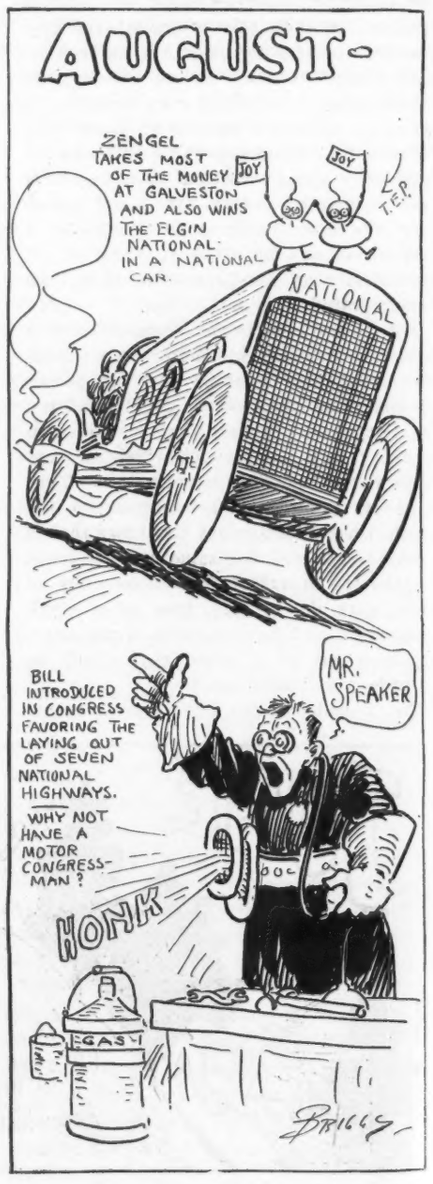
Zengel takes most of the money in beach meet at Galveston, Texas.

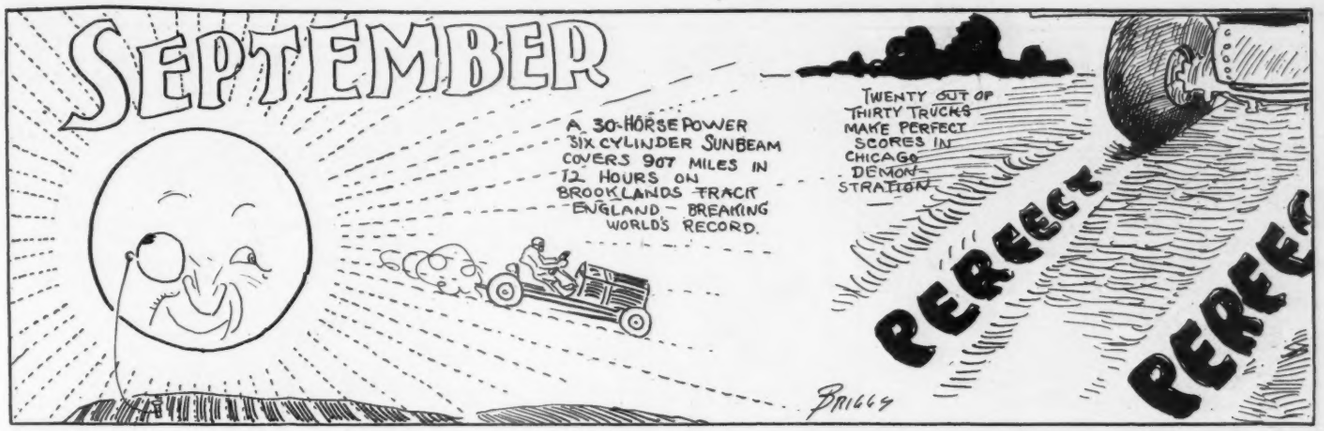
Bill introduced into congress favoring the laying out of seven national highways.

Ford car makes second best time in Mont Ventoux hill-climb in France.

Chicago to Detroit and return commercial motor vehicle demonstration, lasting 9 days, attracts twenty-six contestants, only one going through with a perfect score.

National stock chassis road races are run at Elgin, Zengel, National, wins Elgin National; Herr, National, Illinois cup; Hughes, Mercer, the Kane County; and Roberts, Abbott-Detroit, the Aurora cup.





What Government Has Done for Roads

Logan Waller Page Reports 11,000 Miles of Road Were Improved With Hard Surface in 1911—Total Expenditure by Uncle Sam is $142,000,000

BY LOGAN WALLER PAGE

Director, Office of Public Roads, United States Department of Agriculture

THE past year has been one of unusual activity in all lines of road work. It is estimated that no less than 11,000 miles of public roads have been improved with a hard surface. The total expenditure for road work is believed to exceed $142,000,000, which is at the average rate of $64.63 per mile of public road, or $1.55 per inhabitant. Through the office of public roads the government has aided in many ways in this great work.

No one who has carefully considered the subject disputes the need and value of good roads. But there is a wonderful superabundance of schemes, both new and old, which, like the once so popular patent medicine nostrums, are heralded to cure any and all ills, whether real or imagined. One of the most important and fruitful lines of work by this office has been, by practical demonstration, scientific research and a wider dissemination of knowledge and a better understanding of the fundamental principles underlying all road improvements, to guide tne now gathering force of public opinion into right channels, and so prevent the enormous waste of money and energy which always results from misdirected efforts. The need of this work can be better understood when we consider how greatly the questions which confront the road-builders vary with the local conditions.

Instruction in the art of road-building to be of real practical value, must be adapted to the peculiar conditions of each locality. The government has found that such instruction can best be given through the medium of object-lesson roads, built at local expense. During the past fiscal year fifty-two such roads were constructed under supervision of the experts of the office of public roads. When we consider that each of these fifty-two object-lesson roads were in reality a practical school of applied road-building, especially adapted to the local problems involved, it is evident that this feature of the government's work is a powerful factor in rightly directing the great nation-wide movement for the betterment of our public roads.

But there is another line in which the work of the office of public roads takes a still wider scope. This is what we term the model system work. Instead of a single piece of road being dealt with, the county is made the unit. A comprehensive study is made of the entire road system of the county as to classification, location, materials, systems of construction, maintenance and administration. During the past fiscal year fourteen counties in eight states were studied in this manner, and a practical working scheme for the present as well as future improvement and maintenance of a county road system was given to the proper authorities.

Concerning difficult and special problems which could not be readily handled by the local authorities, the office of public roads acted in a consulting capacity, giving advice to 183 local communities in thirty states. Lectures and addresses of a practical and instructive character to the number of 723 were given in thirty-five states. These lectures had a total attendance of over 200,000, a large majority of whom were farmers. Six hundred and eighty-five samples of road-building materials have been tested in our laboratories. The experimental and research work has yielded gratifying results. One notable result of this work was the discovery of oil-mixed concrete, for which a public patent has been granted so that any one may use this process without the payment of royalties. Recently completed statistical and economic investigations show the total road mileage of continental United States to be 2,199,387 miles, of which 190,467 miles, or 8.66 per cent, were improved with a hard surface.

Another rather novel line of work was that of operating road improvement trains. These trains in general consist of a lecture car equipped with a stereopticon for giving illustrated lectures, and other cars carrying models of roads, bridges, enlarged photographs illustrating various features of the road subject, together with exhibits of modern road-building machinery. Illustrated lectures are given at each stopping place. Up to the close of the fiscal year 65,000 persons, mostly farmers, had heard the lectures and viewed the exhibits. In general, it may be said that while the government has made no direct appropriations for road-building, it has done much to both lessen the expense of road improvements and to prevent loss through improper methods. The rapidly changing traffic conditions have necessitated equally radical departures from old methods of road construction and maintenance.

Methods which but a few years ago were considered as satisfactory and firmly established, both in theory and practice, are now often found to be entirely inadequate. A great deal of careful scientific as well as educational work is needed in order to solve correctly the many difficult problems which have arisen in regard to the administration, construction and maintenance of our public roads. Here is a large and legitimate field for government endeavor which the office of public roads has been doing, and which should prove of the greatest value to the country as a whole.

SEPTEMBER

Hearne in Fiat and Jenkins in Cole win two Cincinnati road races.

Oakland captures Enos trophy in Buffalo reliability.

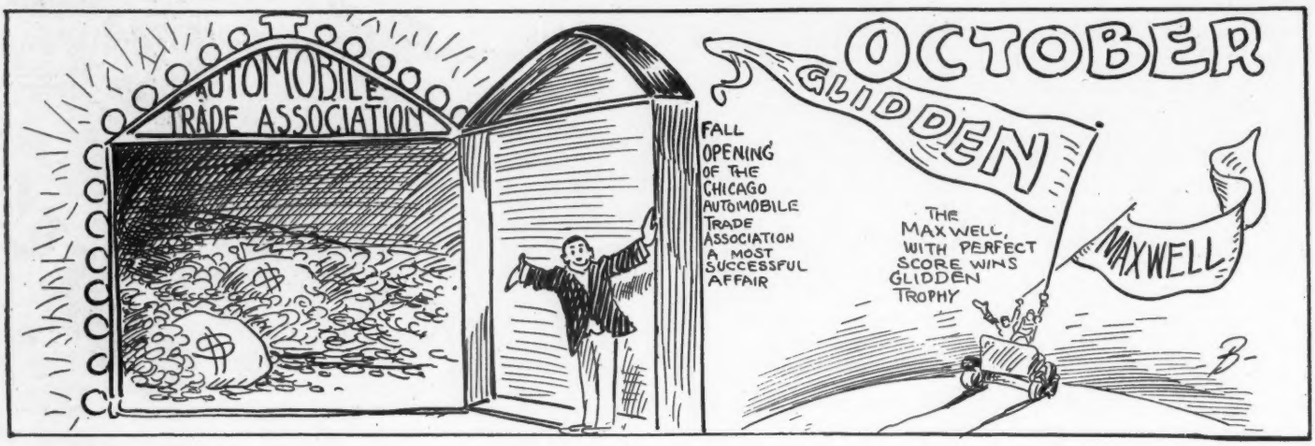
A 30-horsepower six-cylinder Sunbeam covers 907 miles in 12 hours on Brooklands track in England, breaking world's record.

Twenty out of thirty-two trucks make perfect scores in Chicago demonstration.

Syracuse track meet marred by a tragedy. Lee Oldfield in a Knox running into crowd and killing twelve spectators.

Ford wins the Omaha reliability.

Motor-driven fire-fighting apparatus displayed at firemen's convention in Milwaukee.



To Have Only Stock Car in Reliabilities

It Is W. H. VanDervoort's Belief That Contesting Machines in Races and Tests Should be Standard Product of a Bona Fide Manufacturer

BY W. H. VAN DERVOORT
President Moline Automobile Co.

FROM the reliability contest standpoint there can be no argument whatever between free-for-alls and stock car contests. If racing contests are to continue, and undoubtedly they will, I would strongly advocate confining them wholly to stock car events, as this would in a measure limit speeds and make for safety in racing. From my viewpoint there are three benefits derived from racing and touring events.

First, entertainment for a sport-loving public.

Second, the educational benefits that the manufacturer of the car and the purchaser of the car may obtain through the lessons learned from the performance of the car.

Third, publicity, excellent for the winner, as he can hammer away on it in his printed matter and general advertising, and not especially detrimental to the loser, as the results of all contests are very quickly forgotten by the public if not continually called to their attention.

The former is almost wholly absent in the reliability contest, which therefore places the reliability contest on a purely business basis and as a consequence should automatically bar out specially-designed and specially-constructed cars. No car other than the standard product of a bona-fide manufacturer should be permitted to enter a reliability contest. The public then knows that the product that it buys from a manufacturer who has entered this contest will be precisely the same as the cars which may or may not have made records in the contest. I believe that the purchaser of a car should look closer to the capabilities of the machine he buys as demonstrated in reliability contests.

In no way can a manufacturer improve the quality of his product faster than by profiting by the lessons learned in these contests. He not only has the opportunity to study the weak points of his own, but his competitor's car, thus enabling him to more intelligently re-design those points of his product which may prove weak or perhaps positively bad.

The A. A. A. rules governing reliability contests; with the very careful technical examination before and after the contest, are in my judgment very carefully worked out and offer few if any points of criticism.

The entrants in reliability contests are not always as careful as they should be in the selecting of their observers. An entrant will almost without exception choose with the greatest possible care the driver of his car, and then put on as an observer for his car, at the eleventh hour, almost anyone who can qualify. I feel that greatest care should be exercised in the selection of the observers, using only clean cut, intelligent men thoroughly familiar with the motor car and the rules.

When contests are run in different divisions, such as roadsters and touring cars, observers in each division should be confined to that division, as naturally their interests are in the particular division of their entrant, and there will be no disposition to be careless in the performance of their duty or temptation to show favoritism.

I believe it would be very desirable to increase the list of fixed penalizations and in all cases the penalty imposed should be determined very largely upon the importance of the particular part penalized. While the present list of fixed penalizations have been carefully studied out, I nevertheless believe a few modifications might be made advantageously. For example, a penalty of 5 points is imposed for a broken spring leaf. I believe this penalty is correct for all leaves except the main leaf. The penalty for a broken main leaf should be very much higher. I would suggest as many as 15 or possibly 25 points be given.

I believe that in the clutch test, stalling of the motor should be cut out. In other words, the rear wheels should be made to either spin or the front wheels to climb the curb.

I appreciate that the manufacturers have not been patronizing the reliability contests as well as they should have, for the good of the industry. If they would but consider them from the educational standpoint largely and would enter them with the view of learning more about their own product, the industry as a whole would benefit.

As for permitting anything other than stock cars to be entered in reliability contests, I can see no grounds whatever for argument, as the specially-constructed car should have absolutely no standing in a contest of this character.

OCTOBER

Bergdoll in Benz takes chief honors in Fairmount Park road race, Philadelphia, Lozier, National and Mercer class winners.

Fall opening of Chicago Automobile Trade Association a most successful affair.

World's road record smashed twice in 1 day at Santa Monica, first by Merz, then by Herrick, both in Nationals, average being 72.62 miles per hour. Keene in Marmon and L. Nikrent in Buick, other winners.

France decides to revive grand prix in 1912, announcing a 1,200-mile 2-day race.

Samuel M. Butler, chairman of the A. A. A. contest board, killed on Glidden tour.

Maxwell team, with perfect score, wins Glidden trophy.

NOVEMBER

Moline and Staver-Chicago have only perfect scores in Chicago's five-state tour.

Herrick in National victor in desert road race.

England's annual Olympia show brings together 111 distinct makes of cars.

First report of General Motors Co. shows a net profit of $4,066.176 for 10 months.

Society of Automobile Engineers visit England and France.

Mulford, Lozier, wins the Vanderbilt; Bruce-Brown, Fiat, the grand prix; Hughes, Mercer, the Savannah cup and Witt, E-M-F, the Tiedeman at Savannah.

Road congress at Richmond, Va., is a remarkable turnout of enthusiasts working for highway improvement, more than 1,000 delegates attending.

The Society of Automobile Engineers

SINCE the last annual meeting of the Society of Automobile Engineers much progress has been made in the direction of the program laid out at that time. The aim of the society is to do as much for the motor industry as the master car builders have done for the railroad industry of this country; to write technical papers, and publish them for the use of all those interested in the industry.

It is hard to say which of the two is the more important function of the society. Certainly the former is sure to yield immediate commercial advantages and the latter lead to rapid advances in an engineering way. At any rate, both of these lines of endeavor are being followed with equal diligence and apparently with good results. If we can hold the splendid support given us during the last year by both manufacturers and engineers, progress must be rapid.

The manufacturers have boldly endorsed, adopted and used the few standards already sent out to our membership in the S. A. E. data book. It is unfortunate that all the standards adopted have not yet been printed, but time and lack of money have prevented. With so much undertaken it has been found impossible to do everything.

It is very gratifying to know that the data books have been so quickly made use

President Souther Tells of Progress Made in Past Year by His Organization—Has Support of the Manufacturers Throughout Entire Country

BY HENRY SOUTHER

President Society of Automobile Engineers

of. They are to be found in many drafting rooms. They are being used in a practical manner, that is, the draftsman takes from the data book dimensions and figures adopted as standard, in place of taking the time and expending the energy in originating.

With an S. A. E. missionary or two in each shop these data books and the standards printed therein are bound to come into universal use, because they do save time and makes it easier for the draftsman. All the missionary has to do is point out now and then to the draftsman that there is a standard which will save him time and effort.

There is no better work for a missionary to do than this, in order to promote the welfare of the Society of Automobile Engineers.

There is no longer any need of designing the details of a truck wheel, for example, as far as tire equipment is concerned. It is all given in the data book.

There is no need of consulting any other authority for screw standards and dimensions. It is all found in the data book.

There is no longer need of searching among many books and authorities for steels, for babbitts, for brasses, for bronzes. The best information obtainable is to be found in the data book.

There is no longer any need of writing long specifications for steel or other materials. All that is necessary to put on drawing or in purchasing agent's order is S. A. E. specification No. —.

DECEMBER

Annual meeting of the American Automobile Association is held. R. P. Hooper is re-elected president and the old administration retained.

France decides to revive its annual show because of prestige given Great Britain by its Olympia exhibition, which attracts world-wide attention.

Motor Age's annual review of road racing makes Harvey Herrick the champion driver of 1912 and the National the champion car.

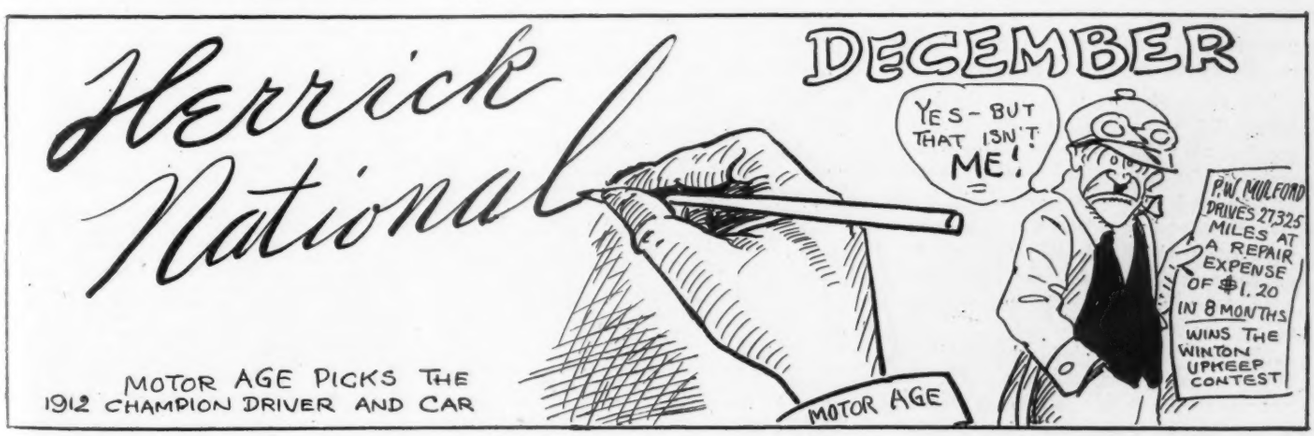
P. W. Mulford of Cincinnati wins the annual Winton upkeep contest with 27,325 miles, made in 8 months, at a repair expense of $1.20.

Three thousand men and 2,000 teams build 33 miles of road in Lincoln county, Oklahoma, in an 8-hour day free of cost to the county.

Europe counts its cars and finds that in ten countries there are 223,382 machines in use, with England leading with 75,600.

German makers boycott the French grand prix.

Resolution is introduced into the Fairmount park commission to abolish the annual Fairmount Park road race in Philadelphia.



Holds Nobby Tread Infringes Staggard

Judge Hazel in United States Circuit Court in New York Hands Down Decision Favoring Republic Rubber Co. Against Morgan & Wright in Fight Over Mell Patents—Injunction and Accounting Authorized

NEW YORK, Jan. 1—Judge Hazel in the United States circuit court, in a decision announced last Saturday, ruled that the Nobby tread anti-skid tire made by Morgan & Wright is an infringement of the Mell patents owned by the Republic Rubber Co. and under which patents the Republic Staggard tread anti-skid is manufactured; in a word the Nobby tread is an infringement on the Staggard tread.

Judge Hazel holds that claim 1 of the Mell patent is infringed. This claim is: "A tire for vehicle wheels provided with outwardly projecting circumferentially-arranged elongated studs, each having inwardly diverging walls, a flat outer surface, and a relatively large base, substantially as described."

The Staggard tread consists of continuous circles of elongations, the elongation of each row breaking joint with the elongations on adjacent rows. In the Nobby tread broader elongations are used, but they are mounted angularly on the tread surface and do not break joints with adjacent rows.

Battle in Courts

In the case, which has been in the courts for over 2 years, Morgan & Wright's attorneys sought to prove that the Mell patent No. 898,907, granted September 15, 1908, had been anticipated in such patents as the Bailey in America and the Healy in England, the Bailey patent being No. 588,724, dated August 24, 1907; and the Healy patent being dated earlier. Regarding these two previous patents the court held that the Healy device never had been used on a motor car and that, although the bosses on the Healy strongly resemble those on the Staggard, yet there are substantial differences, namely, that while the top of the Staggard tread elongation is flat, that on the Healy came to a point and that these erroded after a run of 200 miles and that their warped appearance indicated that they possessed little ability to prevent skidding.

The court further held that the Bailey tread did not anticipate the Staggard tread in that the Bailey boss consists of a series of frustro conical teeth on the tire surface and that they are without the elongation and rounded ends of the Staggard and without this they are unable to get the necessary grip on the road or pavement to reduce the skidding movement of motor cars.

The court further held that while the Staggard tread bears resemblance in many respects to the Bailey and Healy treads of earlier patent date, yet the Staggard tread improvements were made by the exercise of inventive genius; and that, although some of the elements of claim 1 are old and found in one or more prior tires, yet such elements never before have been assembled in the same way and caused to co-act so as to produce a new and useful result.

The court authorizes an injunction and accounting but does not tax the costs of the proceedings.

The next step in the litigation is for the attorneys for the complainant to frame a decree in accordance with the opinion of Judge Hazel and when such a decree is signed providing for injunction, hearings before one of the United States commissioners may be had to determine the amount of damages.

On the other hand, the present status of the case may not be permanent as the decision of the circuit court is not final. The case may be appealed after all the other means for obtaining a rehearing and review of the matter have been exhausted in the lower court. Then the case would go to the United States circuit court of appeals, which in all but a very small number of patent cases, is the court of last resort. The supreme court occasionally takes jurisdiction of an isolated patent case on writ of certiorari, but the probabilities are slight that such a case ever will reach that tribunal.

It was announced by the United States Tire Co., of which Morgan & Wright are a constituent part, that the case would be taken to the United States circuit court of appeals in due course.

The interlocutory decree will be filed in the immediate future, probably this week and it is quite likely that further action against other tire-makers will be started.

The matter has been in the hands of Judge Hazel since October 17 and its filing just before the abolishment of the United States circuit court came as a big surprise to motordom generally. It is probable that the matter cannot be fully adjudicated within a year.

Decision in Full

Judge Hazel's opinion follows:

This is an action in equity charging infringement by defendant of letters patent 898,907, issued to Tod J. Mell, September 15, 1908, for improvement of pneumatic rubber tires for vehicle wheels. The patent refers to the tread surface of pneumatic rubber tires, which may be used on single tires or on tires having inflatable tubes. The object of patentee was to give the tire a superior road-gripping quality, to reduce to a minimum the side skidding tendencies under varying load and road conditions, and also to make it durable and puncture-proof.

The bill also avers infringement of the trade mark "Staggard" and unfair competition, in support of which allegations evidence is contained in the record; but such allegations of claim 3 have been dropped and complainant rests his case upon the alleged infringement of claim 1 only, which reads: "A tire for vehicle wheels provided with outwardly projecting, circumferentially arranged, elongated studs each having inwardly diverging walls, a flat outer surface and a relatively large base, substantially as described." The claim is fairly descriptive of studs on the periphery of the tire in that they are first, outwardly projecting, second, circumferentially arranged, third, elongated, fourth, with inwardly diverging walls, fifth, a flat outward surface, sixth, a relatively large base.

The studs are molded integrally with the body of the tire and placed in series around its surface. They have rounded ends with flat outward surfaces and divergent side walls and they break joints with the adjacent studs. They are arranged in zig-zag form across the tread surface of the tire. The specification says the spaces between adjacent studs are "outwardly diverging—the better to clear the structure from mud and foreign matter that otherwise might accumulate and be compressed between said studs, thereby impairing their usefulness as anti-skidding contrivances." It is evident that said tire is intended for use on motor cars as distinguished from bicycles and motor cycles though the patent contains no limitations.

The defendant contends that the patent is invalid; or if valid, that it must be limited to exclude defendant's tire from its scope and generally denies infringement. Many prior patents for bicycle tires are in evidence and defendant claims that by such patents and publications it is shown that studs or projections on the outer surface of the tire, substantially similar in construction and appearance to complainant's tire, and which operated in the same way, were old at the date of the invention; and that by applying ordinary skill, the patentee simply changed their appearance and dimensions slightly to strengthen them so as to adapt them to the use of the motor car.

Finds Patentable Merit

It must be conceded that in view of the prior art, the claim in suit is not broad and any rights to equivalents are correspondingly meager; but nevertheless I think the alterations made in the studs are not without patent able merit. In strengthening them and imparting to them distinctive characteristics the patentee has appreciably lessened the danger of forward and side skidding in motor cars. Users of high power cars quickly recognized such characteristics and the advantages derived from their use, as is evidenced by the popular approval by the large sales, and by the displacement of other tires and devices used for similar purposes. This is an important factor bearing on the question of patentability. Krementz vs. Cottle, 148 U. S. 556. This is a case in which it is not easy to decide that the patent in litigation is invalid or anticipated by antecedent art. Although utility is not an absolute test of validity—McClain vs. Ortmayer, 141 U. S. 419—it nevertheless must be considered in this case in the determination of the question. The sudden dangers from side skidding of motor cars on wet or muddy roads was something to be feared and dreaded. Dealers in tires made early and repeated efforts to minimize this evil. Their efforts in this direction continued for 10 years unabated. It is shown that there have been many attempts in recent years prior to the patent in suit to adapt bicycle tires having anti-skidding studs or corrugations to cars to reduce the tendency to skid, and that such efforts failed to achieve desired success. In testifying to the merits a number of witnesses have sworn that the Mell tire is more efficient in preventing skidding on different kinds of muddy or dry pavements and roads than any other tire known to the trade; that experience with former kinds and styles of non-skid has demonstrated that they are only efficient for a few hundred miles, while the efficiency of the Mell tire extends to 2,500 or 3,000.

To anticipate the patent the defendant relies on the expired Healy British patent 20,544, and United States patent to Bailey 588,724, dated August 24, 1897, for bicycle tires. The Healy tire concededly never has been used as motor car tire save that the witness Mell tested it and used it experimentally before he conceived his invention. There is a resemblance between it and complainant's tire; but the differences in the configuration of the studs on the periphery of the tire, though slight, are substantial. In the Healy structure there are three rows of elongated studs or ridges on the surface of the tire, arranged longitudinally, each row breaking joints, as in the complain-

ant's tire—with those of the adjacent row. All the studs are of the same form and dimensions, but instead of being rectangular and flattened at the top as are the complainant's, they are rounded with pointed ends. The distinguishing features, though few, are, I think, clearly defined.

Prior to the present invention the inventor made a rubber tire to correspond to the Healy drawing and specifications, and enlarged it for use on a car. The proofs show that the tread proved unsatisfactory as an anti-skid device, in that the studs after a run of 200 miles had an eroded and warped appearance, indicating that they retained little resistance to side skidding. He then designed the elongated studs specified in the claim in controversy.

In the Bailey patent is described a series of frustro conical teeth located on the surface of the tire, "the bases of which are preferably tangent to each other." The teeth are made to "flex and bend freely laterally" under the weight of the bicycle and rider. It is the defendant's contention that the Bailey tread as described has the essential features of the Mell invention and accordingly anticipates it. But I do not think so. It is true the Bailey studs or teeth at their top are flattened and a trifle elliptical and the side walls tapered to enlarge the base; yet, they have not the elongation with rounded ends of the complainant's studs, and without that they are unable to get the necessary grip on the road or pavement to reduce the skidding movement of motor cars. The gripping capacity of studs was the desideratum of the complainant's invention and this characteristic is absent in the Healy and Bailey patents.

Examined Antecedent Patents.

Other antecedent patents in evidence claimed to anticipate, have been examined by me and it is not believed that they have material relevancy. In the main their tread surfaces were inefficient to prevent the side skidding because the studs possessed straight side walls and angular edges instead of divergent and rounded. It is true that a wide departure in the configuration of the studs from the prior art has not been made, and the solution by the patentee of the problem before him perhaps was not fraught with greatest difficulty; but, nevertheless that improvement was made by the exercise of inventive faculty, in tires of this class is satisfactorily proven.

That some of the elements of claim 1 are old and found in one or more prior rubber tires is unimportant in view of the fact that such elements never before have been assembled in the same way and caused to co-act so as to produce a new and useful result.

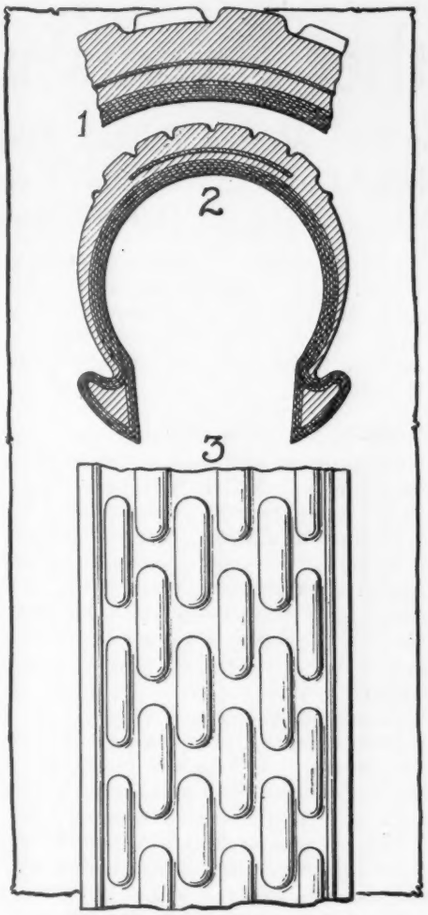
The objection by the defendant that patentee aggregated old elements is without force as in their combination he caused them to perform something more than their special functions—he combined such elements to perform a new, useful and valuable result. The defendant contends that if there is a patentable feature it resides in the method by which the base of the studs is widened and in fillet which co-operates to prevent elasticity of the studs, and as such features are not specifically included in the claim they cannot be added thereto.

It is true enough that the patentee must be bound by the terms of his claim and can claim nothing which is not fairly embraced within its language; but such features are parts of the specifications and are thought to be mere details contributing to the manner in which the base is enlarged and the studs strengthened. Aside from this, the combination of elements specified in the claim is descriptive of the invention and of course it was unnecessary to include the structural details. But to read the fillet into the claim, if it were necessary to do so to save the patent from invalidity, would not, it is thought, do violence to the patent law; although it would be different if the purpose were to read something into the claim not contained therein by reasonable construction, to avoid anticipation or escape infringement.

Contentions of Defendants

The defendant also contends that to elongate the studs, to round the ends and taper the walls, were obvious things to do, and did not involve the exercise of inventive thought, but, as heretofore indicated, I am convinced to the contrary. The great weight and speed of motor cars prevented using anti-skid tires specially designed for bicycles and ordinary vehicles. The problem presented to dealers in tires for motor cars was not one which the manufacturer of bicycle tires, with the prior art before him, could have solved and the alterations and modifications made by Mell were due to his inventive skill. The defendant further contends that its tire is essentially different from the complainant's and that no confusion as between the two results to the trade.

To the eye, it is true, the tires look different; nevertheless, the studded treads of complainant's tire are appropriated by the defendant's, whose studs are alike in appearance, style and dimensions. They are arranged in rows around the outer surface and are longer than their width and rounded at the ends, with their tops flattened and sides tapered, with enlarged bases.



REPUBLIC STAGGARD TREAD

1—Longitudinal section; 2—Cross section; 3—General appearance of tread

They are arranged obliquely, differing in that respect from complainant's. They extend around the periphery of the tire, and by such use and configuration substantially the same result is achieved. The oblique arrangement, though perhaps more efficient, does not avoid the claim. Nor is it avoided by the use of a tread like that of the Heinemann British patent 2,260, as such use also embodies the specific elements of the claim which is the substance of the controversy.

Such being the conclusion reached, it follows that claim 1 of the patent in suit is valid and infringed by defendant.

Complainant may have a decree for injunction and an accounting, but without costs.

PROSPERITY IN DETROIT

Detroit, Mich., Jan. 1—Detroit motor car manufacturers and dealers are celebrating today the advent of what gives every promise of being the most prosperous year in the history of the industry, and this notwithstanding the presidential election.

Some idea of what the motor car has meant to Detroit in a commercial way the past year may be formed from the records of the Detroit clearing house, which show bank clearings of $968,647,059 for the year, as against $910,835,008 for 1910, an increase of $57,812,051, or 6.34 per cent. The increase over 1909 was $200,908,935. The motor car industry naturally is entitled to a large share of the credit for this excellent showing.

In the building line, too, the year 1911 showed a great increase, for which the motor car is largely responsible. The total number of permits issued during the year was 6,667, as against 5,498 in 1910, and the total cost of the buildings represented by these permits was $19,012,370, as compared with $17,415,950 in 1910, an increase of $1,596,420. These figures speak for themselves.

WOLVERINES AS GOOD FELLOWS

Detroit, Mich., Jan. 2 — The Wolverine Automobile Club was host to 250 poor children and a few mothers on Christmas day, and the youngsters had the feast of their lives. The dinner was served in the club rooms in the Griswold house and there was more than enough to go round. Before the dinner, the kids were entertained at a moving picture theater. Each boy and girl carried home, in addition to the internal burden, a big orange and a big basket of food for another meal or for those who couldn't leave home to attend the feast.

RANDOLPH TRUCK PLANT SOLD.

Flint, Mich., Jan. 1.—The Randolph Motor Car Co. has been sold by the General Motors Co. to Eugene G. Goldman of Chicago, who formerly owned it, it is announced here. The purchase by Goldman, it is said, will not affect the location of the plant and it is said that the output of motor trucks will be increased.

PROGRESS OF BRUSH STUNT

Philadelphia, Pa., Dec. 30—The Liberty-Brush demonstrator today finished its second week of public demonstrating, with a combined total of 337 demonstrations for the fortnight. The route traversed during the first week was north and south on Broad street, this week east and west on Market street, next week on Chestnut street between the Delaware and Schuylkill rivers.

GRAND PRIX A CERTAINTY

New York, Jan. 2—A cablegram from Paris announces that the required minimum of thirty entries for the grand prix has been received and that the classic of the Automobile Club of France, set for next July, is a certainty. Already there are more than forty nominations in hand and entries at extra fees can be made up to March 1. It is reported a Ford has been entered in the light-car section of the race.

PROTOS WINS MEXICAN RACE

Mexico City, Mexico, Dec. 25—The third annual El Emparcial-El Automobile Mexico-Puebla road race that was run between this city and Puebla yesterday, a distance of about 135 miles by the road, was won by Basini in a Protos. The starters numbered fourteen, in the three classes, A, B, and C. Eight finished in the following order: Itala, Eladio Campero; Protos, Ubaldo Basini; Stevens, Domingo Costabile; Buick, Rafael Gonzalez; Buick, Marcario Perez; Lancia, Cesar Ghiglino; Delahaye, Juan Berutto; Protos, R. Pinchetti.

Shows and Other Events in the Industry

Annual Exhibitton in Buffalo on This Week, a Brilliant Display—Mais Company Increases Capitalization To Meet Its Financial Needs—Exports and Imports for November—Palmer Out of Cartercar

BUFFALO, N. Y., Jan. 1—The show season of 1912 is on now, the first of the winter affairs being the local exhibition, which opened Saturday night, the tenth annual show in the Seventy-fourth Regiment armory, Niagara and Connecticut streets, under the auspices of the Automobile Trade Association. The car models are housed in the drill room of the armory, which comprises 66,000 square feet of floor space and which is 23,000 feet larger in area than the Madison Square garden in New York city. The drill room in which the Buffalo show is being held measures 310 feet in length and 240 feet in width, giving ample floor space for exhibition purposes. The show is the most complete and elaborate exhibition ever seen in Buffalo.

Through the main entryway to the vast drill room stands out the brilliantly lighted central aisle of the exhibition floor, flanked by uniform white foliage-trimmed pillars bearing glittering golden standards, upon each of which in harmonizing type is displayed the various makes of cars allotted to the various exhibition spaces. Upon extending arms above each standard there are two powerful inverted incandescent lights throwing intense light upon the high finish of the myriad cars artistically grouped by the exhibitors. There are two parallel aisles similarly treated extending down either side of the armory, where accessories, commercial cars, motor trucks and kindred exhibits are grouped.

There are three beautifully brilliant cross aisles in the drill room besides those at the south and north ends of the armory. Gilded standards also divide the inner boundaries of the exhibition spaces. The great vaulted steel-trussed roof of the armory is artistically treated with rich green and red streamers and the floor of the exhibition spaces is carpeted in red.

The list of exhibitors shows the following makes: Abbott-Detroit, Pope-Hartford, Stevens-Duryea, American, Babcock electric, Winton, Cadillac, Cartercar, Chalmers, Hupmobile, Stearns, Columbia, Maxwell, Denniston commercial car, De Tamble, Cole, Matheson, Union, E-M-F, Everitt, Marathon, Paige-Detroit, Victor trucks, Warren-Detroit, Ford, Franklin, Grabowsky, Havers six, Hudson, Hupp-Yeats electric, R-C-H, Kisselkar, Klinekar, Knox, Pullman, Reo, Krit, Marion, McFarlan six, Mitchell, National, Pathfinder, Oakland, Overland, Packard, Peerless, Pierce-Arrow, Premier, White, Rauch & Lang, Stoddard-Dayton, Velie.

Many persons from surrounding cities are in attendance at the Buffalo show, including a delegation of dealers from Rochester, N. Y., who are getting pointers for the show to be held at Rochester, January 22-27. A delegation of Syracuse men are expected to attend the local show later in the week.

MORE MONEY FOR MAIS

Indianapolis, Ind., Jan. 1—In order to meet its present financial needs, the Mais Motor Truck Co. has increased its capitalization $75,000. Will H. Brown, president of the company, states the increased stock has been taken by the old stockholders. It is expected that this move on the part of the company will result in the early dismissal of the suit for receiver brought by Harry S. Bloch, of Wheeling, W. Va., some time ago.

Bloch brought suit on the ground that the company was insolvent and that it had lost an option on certain property because it had been unable to meet a required payment of $5,000 on the option. Bloch, however, did not allege that the company was indebted to him.

The judge of the court was informed that the company had plans under way for additional financing, which would take care of present needs, and consented to postpone hearing of the case until opportunity was given to carry out this plan. The judge also authorized the company to continue operations under the direction of the court, but to pay no accounts except for labor.

Creditors of the concern also were called in by the company and the situation was laid before them, and they agreed to not press their claims until the company had an opportunity to get on its feet. It was shown that the assets were in excess of the liabilities, but that the company needed additional ready money.

Stockholders of the company agreed to take $75,000 worth of additional stock and there has been no change in the management as a result of the additional capitalization, except that Alfred W. Markham has resigned as treasurer. The place is being filled temporarily by Hiram Moore, assistant treasurer.

MORE CASE RUMORS

Racine, Wis.—Although details of the reorganization are not yet completed, it is authoritatively announced that the J. I. Case Threshing Machine Co. of Racine will in a few days become one of the greatest industrial corporations in Wisconsin, and probably the largest in this territory in point of capitalization. The present capital stock is $5,000,000 and, it is said, this will be increased at once to $40,000,000, one-half being 7 per cent preferred and the other half common stock. The name will be the J. I. Case Co., and its line of products, which includes the Case motor cars, will be greatly extended to cover the entire harvesting and farm machinery field.

To carry out this plan, the Case company will close negotiations at once for the absorption of several large plants specializing in various types of such machinery. These connections will enable the company to place on the market a line of commercial vehicles or motor trucks in addition to Case pleasure cars.

GEORGES DUPUY DEAD

Paris, Dec. 20—Georges Dupuy, a French newspaper man who was well known in the United States several years ago, and who attempted to promote a tour of American cars in Europe, is dead. Mr. Dupuy was a sufferer from consumption and exposure on a motor trip from Havre to Grenoble brought about the end. He was 36 years of age.

PALMER OUT OF CARTERCAR

Detroit, Mich., Jan. 2—R. A. Palmer retires today as general manager of the Cartercar Co. of Pontiac, one of the subsidiaries of the General Motors Co., having tendered his resignation to President Neal last week. Mr. Palmer will remain in Pontiac and will devote his attention to the Franklin Provident and Savings system, recently established there. No successor to Mr. Palmer has been announced, but for the present at least his work will be divided between Factory Manager C. A. Trask and Sales Manager Harry B. Radford. Mr. Palmer was one of the organizers of the Cartercar Co.

EXPORTS AND IMPORTS

Washington, D. C., Dec. 30—That American-made motor cars are having a good sale abroad is indicated by the latest export figures compiled by the government's statistical bureau, which show that during November 1,364 cars, valued at $1,382,804, were shipped abroad. This is a big increase over the shipments for the corresponding month of 1910, when 675 machines, valued at $818,054, were sent abroad. Exports of parts, not including tires, also jumped from $134,649 in November, 1910, to $214,638 in November last. During the 11 months' period ended November, the exports of cars increased from 7,686, valued at $10,339,905, in 1910, to 13,500 cars, valued at $13,990,931, in 1911. The exports of parts, except tires,

during these periods, were valued at $1,804,436 in 1910 and $2,951,188 in 1911.

The detailed shipments during November and the 11 months ended November were as follows:

Exported to—	November, No.	Value	11 Months. No.	Value
United Kingdom	397	$334,151	3,173	$2,741,524
France	19	12,684	385	425,714
Germany	11	6,584	106	118,710
Italy	4	2,445	171	194,784
Other Europe	20	15,264	705	650,642
Canada	256	366,774	4,556	5,137,685
Mexico	52	81,309	262	432,316
West Indies and Bermuda	27	32,440	263	303,434
South America	143	163,824	909	1,131,182
British Oceania	312	269,333	2,041	1,871,716
Asia and other Oceania	97	72,016	742	719,083
Other countries	26	25,980	247	264,141

Ninety-six motor cars, valued at $214,133, were imported during November, as against seventy-three cars, valued at $152,596, received in this country in November a year ago. Imports of parts, except tires, also increased in value from $15,634 to $30,450. During the 11 months' period, however, the imports of cars declined from 941, valued at $1,901,655, in 1910, to 869 cars, valued at $1,871,414, in 1911, while the imports of parts fell in value from $630,823 to $297,442.

Foreign cars were imported from the following countries during November and the 11 months ended November:

Imported from—	November, No.	Value	11 Months. No.	Value
United Kingdom	23	$ 47,152	150	$ 352,683
France	32	94,291	294	661,956
Germany	18	41,768	147	322,153
Italy	18	22,897	118	182,085
Other countries	5	8,025	160	352,537

CROXTON TRUSTEE REPORTS

Canton, O., Jan. 2—P. L. McLain, trustee of the estate of the Croxton-Keeton Motor Co., bankrupt, filed his second partial account. The account showed a balance on hand of $58,505.60. A dividend of 10 per cent was declared at the meeting.

WOODS COMPANY CHANGES

Chicago, Jan. 2—F. J. Newman, for several years chief engineer of the Woods Motor Vehicle Co., has tendered his resignation and R. S. Fend has been named as his successor. Mr. Fend originally came from the Columbus Buggy Co., but for some time he has been on the Woods staff. There also have been other changes, Carl J. Metzger, sales manager, and Roy Herrington, assistant sales manager, having severed their connection with the Woods company. No statements have been given out as to the future plans of Newman, Metzger and Herrington.

D. W. HENRY OUT WITH COLBY

Chicago, Jan. 2—It was announced today by the Colby Motor Car Co., which was recently reorganized, that D. W. Henry, general manager, no longer is connected with the concern.

IMPORTANT OFFICE FOR J. H. KELLY

Chicago, Jan. 2—John H. Kelly, manager of the Chicago branch of the Republic Rubber Co. since its establishment, has been called to the factory at Youngstown, O., to assume one of the most important offices in the gift of the concern. He has been placed in charge of the motor car tire department of the company and will market that product, having been given control over the chain of branches which the company has throughout the country. In addition he will assume most of the duties of Vice-president Lomasney, who has been forced to take a 6-month vacation because of ill-health.

MEETINGS DURING SHOWS

The program for New York's show season up to date is as follows:

JANUARY 2

Opening of the Importers' Salon at the Hotel Astor.

JANUARY 3

Presentation of the Glidden trophy at Rector's.

JANUARY 6

Opening of garden show.

JANUARY 8

Directors of A. B. of T. meet.

Springs division, S. A. E. standards committee at 9 a. m., headquarters.

JANUARY 9

Annual meeting of the A. B. of T.

Executive committee of the A. A. A.

Executive committee of the American Automobile Association at headquarters.

Directors M. and A. M. at 11 a. m.

Contest committee, N. A. A. M.

Meeting and lecture, S. A. E., at the Automobile Club of America.

Meeting of iron and steel division, standards committee, S. A. E.

Miscellaneous division, standards committee, S. A. E., headquarters.

Big Village Motor Boosters' dinner at Breslin, 8 p. m.

JANUARY 10

Opening N. A. A. M. show at Grand Central palace.

Closing Importers' Salon at Hotel Astor.

Banquet of importers at Astor.

Touring board of A. A. A.

Special advisory committee, S. A. E., on electric lighting.

Meeting S. A. E. council at 10 a. m.

Regular meeting M. and A. M. at Waldorf, 10:30 a. m.

JANUARY 11

Annual banquet, M. and A. M., Waldorf, 7 p. m.

Directors' meeting, N. A. A. M., 9 a. m.

Annual meeting, N. A. A. M., 10 a. m., headquarters.

Legislative board, A. A. A.

JANUARY 12

Good roads board, A. A. A., headquarters.

Metals division, S. A. E., Charles Y. Knight, chief speaker, Engineering building.

Directors M. and A. M., 11 a. m.

JANUARY 13

Closing pleasure vehicle week at Madison Square garden.

JANUARY 15

Opening truck week at Madison Square garden.

Finance committee, M. and A. M., 10:30 a. m., headquarters.

JANUARY 16

Meeting S. A. E. standards committee.

JANUARY 18-20

Annual meeting S. A. E. at Madison Square garden.

JANUARY 19

Annual banquet, S A. E., at Astor.

LOZIER BRANCH FOR CHICAGO

Chicago, Jan. 2—The Lozier Sales Co., of which James Levy is president, and which has acted as Lozier agent here for several years, has turned back to the parent concern its control of this territory and the merging of interests will result in the establishment of a Lozier branch in this city with H. Huelett of the Lozier traveling force as manager. It is the intention to erect a new building on the row, which will include a service department, and a strong effort will be made in the commercial car field.

BIG INCREASE IN CAPITAL

Milwaukee, Wis., Jan. 2—The Filer-Stowell Co., which controls the F-S Motors Co., the Beaver Mfg. Co. and the Petrel Motor Car Co., has increased its capitalization from $120,000 to $1,200,000. While no changes or extensions are contemplated, the increase in capitalization is said to be for the purpose of making it easier to secure money at times for the carrying on of the business, it is stated.

JOSEPH E. G. RYAN DEAD

Chicago, Jan. 2—Joseph E. G. Ryan, in charge of the motoring department of the Chicago Inter Ocean and one of the best known newspaper men in the country, was found dead in his room at the Congress hotel this afternoon, heart disease being given as the cause of his sudden end. For years Mr. Ryan was press agent of the Chicago show, and in his line he had dealings with several of the large motor car concerns of this country.

ROAD LAW HELD INVALID

Baltimore, Md., Jan. 2—Improved roads in Baltimore county have received a decided setback because Judges Burke and Duncan in the Baltimore county court at Towson have decided that the new law providing for a $1,500,000 loan for building good roads in the county, and to some extent removing the county road system from politics, is "unconstitutional, void and of no effect." The ground for the decision of the judges was that the law provides that the judges of the circuit court of Baltimore county shall perform a non-judicial act in the appointment of the two minority members of the roads commission of the county.

STUYVESANT IN MERGER

Columbus, O., Dec. 30—A $350,000 corporation has been organized by the Grant Less Machine and Tool Co. and the Stuyvesant Motor Car Co., both of Cleveland, to manufacture the Stuyvesant car. The new corporation will take the old name of the Stuyvesant Motor Car Co. and will have its headquarters in Cleveland, with branch agencies in every city in the country.

CRITICISES WORM DRIVE

Reader Believes That New Axle Design Cannot be Transplanted to America

UBOIS, Pa.—Editor Motor Age—In Motor Age of December 14 an article appeared on the worm drive signed Rear Axle. I think this article does not treat the question very thoroughly from the American point of pleasure car use. There are a great many points against the worm—clearance, lubrication, loss of power and gear ratio. It only has one virtue that I can see, that being quietness of action.

Placing the worm under the axle reduces the road clearance so much it would be almost impossible to travel most of our American roads. Ask any one who was on the Glidden tour. The other position would be above the axle, but this is impractical on account of not being sufficiently lubricated.

Lubrication is one of the greatest problems of the worm drive, and would have to be watched closer than any other part of the car. Rear Axle admits that the worm heats a great deal. Of course, this heating comes from friction, and friction means loss of power. The ideal car today, as has been proved over and over, is as foolproof as possible. I hardly think a worm drive would be foolproof with the attention that it requires, and its great dependence upon superior lubrication. If the case ran dry for some reason or the oil level became very low, the result would be disastrous to the worm.

Manufacturers are experimenting to reduce the loss of power between the engine and the road, but by substituting the worm drive for the bevel the loss would be increased greatly. The worm drive's efficiency in the transmission of power is greatly inferior to the bevel gear, which is easily seen by the heat or friction it develops. Rear Axle says that one British manufacturer has given up the worm because in his opinion the engine is too small. This would demonstrate the loss of power, if this engine is large enough with the bevel gear, while not with the worm. Again, the worm accelerates very slowly, which shows loss of power. If you will notice, the British manufacturers who use the worm drive recommend the bevel drive for hilly country. Our roads are so much different from English roads that it is folly to think we can have success with the same things they do.

It is difficult to design a worm which will be reversible, and that brings up another objection. The worm, to be reversible, must be small in diameter, its pitch great, and also must be multiple-threaded. This means that the engine has to do a greater amount of work to cover the same amount of ground as with the bevel, and any reasonable speed will be impossible on account of the necessity of a small diameter worm or low ratio. This, I think, disproves the theory that the worm is just as economical on gasoline as the bevel. Besides, if the worm drags in the least, the car will be unable to coast as much as with the bevel.

Rear Axle speaks of a worm-driven car running 60 miles per hour for many hours before heating the worm to any extent. The design of the worm or ratio forbids any such high speed and I am sure that the worm will begin to heat at half that speed if kept up for a short distance.

In construction the worm is more expensive than the bevel, the casing having to be made stronger and more bearing surface being required to take care of the heavier thrust stress.

A great many American manufacturers have given the worm drive a thorough test and have found that there are so many things against it that its one and only feature, "quietness of action," is too small to overcome them.—W. J. Marlin.

HOME-MADE JACK

Sauk Center, Minn.—Editor Motor Age—I herewith enclose a sketch for use in Motor Age of a jack that can be made quickly and also cheaply, as will be seen by reference to Fig. 2. It can be made in 15 minutes and the cost will not exceed 25 cents each. Nails are used, as will be seen, to hold its parts, but if desired ⅜-inch bolts can be used instead of the nails, which would make it portable in case a motorist wanted to take it on an outing trip, as one could take it apart and set it up again in a very few minutes with a common wrench. It will pack in a very small space, which makes it easy to carry. I am using it for my roadster and find that it works to perfection. Of course the one shown is for a 30-inch wheel only, but the dimensions can be easily varied to suit any style or weight of car. If the car has a truss rod saw out the top of jack to accommodate it. It is very strong and will hold the heaviest car with proper care in making, being careful not to get the brace with too much or too little slant and to give about the same as in the cut.—A. D. Carpenter.

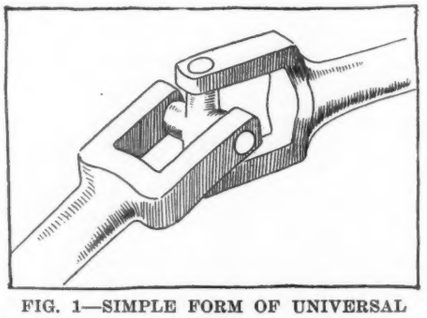


FIG. 1—SIMPLE FORM OF UNIVERSAL JOINT

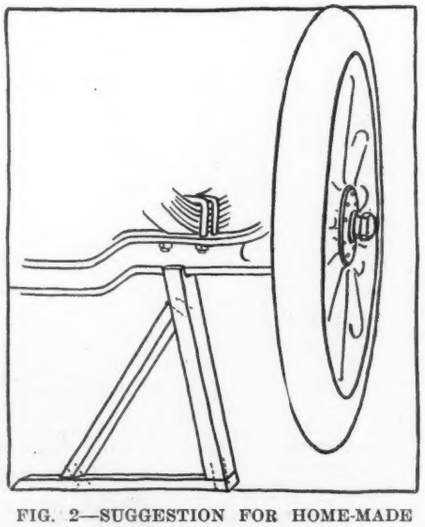


FIG. 2—SUGGESTION FOR HOME-MADE JACK

The Readers'

EDITOR'S NOTE—In this department Motor Age answers free of charge questions regarding motor problems, and invites the discussion of pertinent subjects. Correspondence is solicited from subscribers and others. All communications must be properly signed, and should the writer not wish his name to appear, he may use any nom de plume desired.

FUNCTIONS OF A DIFFERENTIAL

Chicago—Editor Motor Age—Through the Readers' Clearing House, will Motor Age tell me what is the object of a differential, also a universal joint in motor car construction?—C. Neuman.

A differential is the mechanism placed in a rear axle to permit one of the driving wheels to turn faster than the other when rounding a corner. You will understand that in turning a corner the inner wheel does not have to traverse near so great a distance as that required by the outer wheel, and in a shaft-driven or single chain-driven car, where the rear axle is turned by the chain or shaft near its center, there must be a means for permitting the driving motion to be transmitted to both wheels, and at the same time one wheel be allowed to turn more rapidly than the other. The arrangement of bevel or spur gears, by which the two halves of the driving shaft in the rear axle are connected, is called a differential. The differential mechanism most generally used at the present time is the bevel gear design which is illustrated in Fig. 3. The power from the propeller shaft D, which is secured to the bevel gear pinion DP, is transmitted to the bevel driving gear DG. The bevel differential pinions N are journaled on studs in a spider or casing to which the bevel driving gear DG is attached. so that they must turn bodily with it. Now, when the road wheels which are secured to the ends of the axle shafts S and S1, both offer the same resistance to rotation, and the driving gear DG is revolved, the pinions N being in mesh with the differential gears R and R1, cause them to revolve in the same direction. The gears R and R1 drive the axle shafts and consequently power is de-

Clearing House

EDITOR'S NOTE—To the Readers of the Clearing House columns: Motor Age insists on having bona fide signatures to all communications published in this department. It has been discovered that the proper signature has not been given on many communications, and Motor Age will not publish such communications, and will take steps to hunt down the offenders of this rule if it is violated.

livered to both wheels alike. If the one of the wheels on shaft S1, say, is now to be held stationary, and the driving gear DG revolved, the bevel pinions N will revolve on their studs and roll around on the stationary gear R1; this will drive the gear R of the free wheel on shaft S at twice the speed of the driven gear DG.

Where two shafts that are not in the same straight line are to be connected, there must be some means of joining them, so that they will not tend to straighten out and come into the same straight line. This means is termed a universal joint, Hooke's joint, or Oldham's coupling, and consists, in its simple form, of a double yoke on the end of each shaft, through which pins are inserted, the pins allowing the yokes to turn and slide upon them, thus giving motions in any direction. The illustration in Fig. 2 shows the construction.

COIL MAY BE LEAKY

Johnson, Neb. — Editor Motor Age — Through the columns of the Readers' Clearing House will Motor Age kindly explain the following:

We have a Maxwell car with Splitdorf ignition system. We find that the cylinders fire regularly when not pulling a load. But the motor will not pull. The magneto is in good condition. We changed the coil and it works all right. Why will the old coil work when the engine runs idle and not when pulling? —E. A. B.

When the motor runs idle it most probably runs at a much higher rate of speed than when running under a load, and as the strength of the current generated by the magneto and coil increases as the speed increases, a better spark is produced when the motor is running idle. It is possible that the old coil has a small leak or short circuit which cuts down its efficiency, so that the more efficient new coil is capable of inducing the magneto curent sufficiently to produce a good spark at the plugs, even at slow speeds, thus causing the motor to fire regularly under load.

MOTOR POWER AT SPEED

Princeton, Ill.—Editor Motor Age—I would like to have explained in the columns of the Readers' Clearing House why a gasoline motor produces more power when speeded up than when running slow.—F. E. Winbolt.

When a motor is speeded up there is more momentum, or stored-up energy, in the flywheel when running at a high rate of speed than at low speeds. If you throw a pebble at a window it may not break it, but if you increase the speed of the pebble's flight by firing it from a sling-shot or the like, it will be apt to pass right through the glass. If you were to have someone crank a motor over very slowly while you pressed your hand against the face of the flywheel, you would find that as soon as the person stopped cranking the wheel would stop, but if he were to increase the speed of the cranking, or spin it, the flywheel would tend to whirl around several times before it stopped, regardless of the pressure of your hand upon it. Thus the greater its speed the greater its momentum, or power to overcome resistance.

The object of the flywheel is to equalize the rotation of the crankshaft by storing up the force of the impulses and giving it out again during the exhaust, intake and compression strokes. In motors having more than one cylinder the flywheel effect is less necessary in rough proportion to the number of cylinders, as the impulses are more frequent, and some, if not all, of the idle strokes are balanced more or less by impulses. Or, to put it more directly, the single-cylinder engine stands most in need of a powerful flywheel. The momentum of the mass of metal resists changes of speed, whether they tend toward increase or toward decrease, and to this is due the equalizing effect of the flywheel. Up to certain high-speed limits the power of a gasoline motor increases directly with the speed.

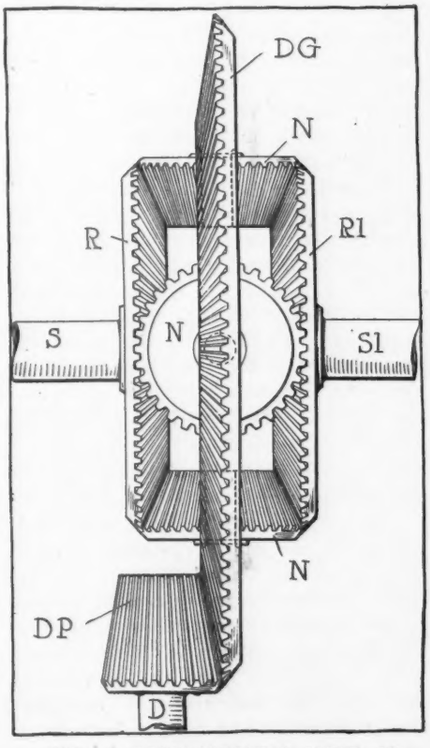


FIG. 3—DIAGRAMMATIC VIEW OF DIFFERENTIAL

INLET UNDER PRESSURE

Suggestions for Increasing Power of Motor By Forced Induction of Charge

Chicago—Editor Motor Age — Several lines of reasoning would seem to suggest that if the maximum power is to be obtained from an engine of given piston displacement the gas should be introduced into the cylinders under pressure. With a steam engine of given bore and stroke the power which can be obtained depends upon the pressure in the boiler, but although designers have gone to great lengths in the way of providing unrestricted inlet passages and large valve areas, and even to some extent in removing back pressure by cooling the exhaust pipes, there seems to have been little if anything done in the way of introducing the charge into a four-cycle cylinder under pressure above atmospheric.

If two cylinders have equal bores and strokes, the one with the smaller clearance will have a higher compression pressure and a correspondingly higher maximum explosion pressure; but if the two cylinders are made to develop equal maximum explosion pressure, the pressure in the one with the larger clearance will drop off less rapidly than in the other. The problem then would seem to be to provide a large clearance without lessening the compression pressure, and the obvious solution, of course, is to introduce the change under pressure.

Various means might be employed to accomplish the results suggested, such as crankcase and other pump compressors and I believe that an appreciable pressure in the inlet pipe might be obtained even by such means as funnel-shaped inlet openings facing forward and receiving a blast from the fan. I believe also that considerable pressure might be obtained in the inlet pipe of a racing car by providing a funnel-shaped opening outside the bonnet facing forward. I have no figures at hand showing wind pressures at high speeds, but the pressure which could be obtained in this manner could easily be calculated, and of course an experimental device might very easily be constructed. I am curious to know whether any attempts have been made to increase the power of an engine in any such manner.—S. D. Hirschl.

The suggestion as to the use of air compressors in the crankcase or in other locations for introducing the air under pressure might be worked out to advantage. Motor Age knows of no attempts along just this line. The method of increasing pressure in the inlet pipe by means of a blast from the fan used in connection with the cooling system was attempted on the Daimler buses in London. It was found necessary to abandon the device, however, on account of the great amount of dust that was drawn into the inlet passages, causing clogged inlets and badly scored cylinders. A funnel-shaped opening outside the bonnet probably would be open to the same objections. There also might be difficulty in adjusting the carbu-

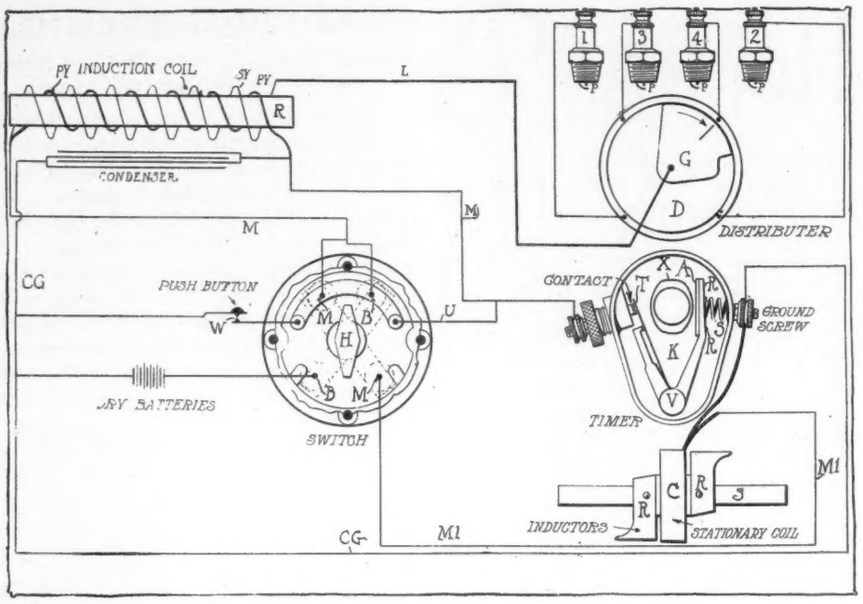


FIG. 4—WIRING DIAGRAM OF REMY IGNITION SYSTEM

reter for all motor speeds under the variations of air pressure, but there is certainly a field for investigation along the lines suggested.

SOFTENING A CONE CLUTCH

Cincinnati, O.—Editor Motor Age—Would Motor Age through the Readers' Clearing House answer the following questions?

1—How can I soften a cone clutch? I have tried kerosene oil and graphite, but the effect lasts only a short time when the clutch becomes harsh again.

2—Is a driver's license necessary to enter races in the United States? If so, where can they be procured, and what do they cost? Are there any other qualifications necessary to enter a race in this country such as the Vanderbilt or Indianapolis 500-mile race?

3—What is the entry fee for a private car in the Decoration day race at Indianapolis?—Penn.

1—When a leather-faced cone clutch develops a tendency to grab or take hold fiercely, causing the car to jump forward with a bound upon starting, instead of moving off gradually, it is an indication that the leather has become dry and requires a little treatment with castor or neatsfoot oil. The best method of applying either of these oils is to remove the clutch and immerse it in a basin of the oil.

To keep a leather-faced cone clutch in good working order, it should be given an application of oil every few weeks. This may be done by throwing out the clutch, then securing the clutch pedal in a manner that will hold it out over night. A block of wood carefully wedged between the front edge of the seat and the depressed clutch pedal will serve to hold the clutch out very nicely where there is no connection between the pedal and emergency brake. When the clutch has been secured in the disengaged position, it should be revolved slowly while a stream of the oil is slowly poured onto the clutch leather and allowed to run down between the leather and the internal friction surface of the flywheel, a pan being placed below the flywheel to catch that which runs out below. When the leather has been thoroughly anointed, the oil should be allowed to soak in for several hours.

When a slipping clutch has been neglected to such an extent that the surface of the leather has been burned and become hard and glazed, the leather will not respond to an oil treatment; and the only suitable remedy is to fit a new clutch leather. To do this one should remove the old leather very carefully, so that it can be gotten off intact and used as a pattern for cutting the new leather.

Clutch leather should be cut from the thick part of the hide, and put on rough side out. In applying the leather one must begin tacking in the rivets at one end and work around the clutch, stretching the leather between each rivet or pair of them. One should be careful to countersink the holes for the rivet heads, so that they sink well below the surface of the leather. After the leather has been applied, it is customary to true up the surface on a lathe, then soak in oil for a few hours.

2—It is necessary to have a driver's license to compete in sanctioned speed contests in the United States. Drivers' licenses can be secured from the chairman of the contest board of the American Automobile Association, 437 Fifth avenue, New York. Last year the registration cost $2. The announcement regarding 1912 registration has not yet been made. The only qualifications necessary to enter a big race such as you speak of are registration and ability as a driver. If a driver shows incompetence during practice he will not be permitted to drive.

3—The fee last year was $500 and it was announced on preliminary blanks that it will be the same for the coming season. This, however, is not official.

OLYMPIA SHOW FACTS

Chicago—Editor Motor Age—I have read with interest the articles in Motor Age issues of November 23 and 30, regarding the Olympia show in London. How many cars were represented in this show? How many use the Knight motor exclusively? How many use rotary-valve types? How many use poppet-valve types?—Charles Weber.

The total number of cars represented at the show was 585. The only firm using the Knight sleeve motor exclusively was the Daimler company of Coventry. The Birmingham Small Arms Co. is selling a car with 2 15/16-inch bore and 4.5 stroke, giving 13.9 horsepower, but the Daimler company is owned by the Birmingham Small Arms Co., and the two are practically one concern.

The Rover company, Coventry, builds cars with a Knight engine in two models, and also lists four models with poppet-valve engines. The Knight engine is built by the Rover company. The Deasy Motor Car Co. exhibited at Olympia five cars, three of which were fitted with Knight engines, and the other two were poppet-valve types. The Knight engines used by this company are built by the Daimler people. Panhard & Levassor exhibited two chassis at Olympia, one being fitted with the Knight engine. The Argyll Motors, Ltd., exhibited six cars on a chassis, one of which was fitted with the single-sleeve engine. Darracq & Co. exhibited five cars, one of which was fitted with a rotary-valve motor. The Italla Automobiles, Ltd., exhibited three cars, one of which was fitted with a rotary-valve engine. Crowdy, Ltd., exhibited three cars, all of which were fitted with the Hewitt piston valve engine.

In a general summary the only firm exclusively using Knight engines is the Daimler. Those concerns using the Knight engine and also poppet-valve engines are Rover, Deasy and Panhard. There is no firm using the rotary-valve type exclusively. The Crowdy used the piston valve exclusively. In Europe Minerva and Mercedes used the Knight type of motor, but not exclusively. There also is one Swiss concern using this motor.

REMY IGNITION QUESTIONS

Erie, Pa.—Editor Motor Age: Some time last year there was published in Motor Age a diagram of the Remy ignition system on the order of the enclosed rough sketch.

1. Will Motor Age kindly reprint this circuit diagram and trace completely from start to end the circuits of the current

generated by the magneto and that furnished by the battery, and answer the following questions:

2. What is the function of the push button and how does it perform this function?

3. For what purpose is the wire U used that leads from wire M2 to the switch shown in the sketch?

4. Do the points marked M and B at top of switch to which branches from wire M connect have connection with the semi-circular piece in the switch to which the wire U and the wire from the push button connect?

5. At what speed in relation to crankshaft speed does this magneto revolve for a four cylinder four-cycle engine? Please give a full and clear explanation of the working fo the magneto.—Remy.

1. The wiring diagram of the Remy ignition system is shown in Fig. 4 and the current may be traced through the various features as follows: When the switch H is turned so that contact is made between the two points N and M, and the motor is in operation, the primary current which is generated in the stationary coil C of the magneto, passes up through the ground screw and the spring S through the V-shaped crank V of the circuit breaker across the contact points T, through the adjusting screw and the wire M2 connected to it to the primary winding PY of the coil, out through a ground wire M to the switch, across the points M of the switch and out through the wire M1, and back to the stationary coil C of the magneto to complete the circuit. As the primary circuit is completed and the low tension circuit flows through the primary winding of the coil, the core R of the coil is magnetized and a magnetic field is produced about it which effects the secondary winding SY of the coil. When the cam X of the circuit breaker strikes the plate A of the V-shaped arm, which is pivoted at the lower point V, contact between the two platinum points T is suddenly broken and the primary current ceases to flow. This breaking of the primary circuit demagnetizes the core C and causes a powerful electro-motive force to surge up in the secondary winding of the coil, and when the revolving segment G of the distributor is synchronously brought opposite one of the terminals whose high tension wire leads to one of the spark plugs, a high tension current flows through the high tension lead L through the revolving segment of the distributor and the high tension cable to the spark plug where it jumps across the gap T and produces the ignition spark.

2. When the motor is not in operation and the operator is desirous of producing a spark in one of the cylinders in an effort to start on compression, he has but to turn the switch so that contact is made between the points B and then operate the push button, thus making and breaking the primary circuit of the batteries and coil and causing the high tension currents so generated to pass through the high tension lead L, the segment G of the distributor the terminal on which it stands and through the high tension cable that connects this terminal to the spark plug; thus causing the spark to occur in that respective cylinder. By operating the push button is meant pushing it in and releasing it a number of times in quick succession. The best spark often is produced by tapping the button sharply with the thumb or the butt of a screwdriver with perhaps a cloth over the end of it to protect the coil box from damage. If on operating the push button no results are obtained, it is possible that the contact points C of the circuit-breaker are in contact and thereby permanently short circuiting the primary circuit and rendering the push button useless. The thing to do in this case is to shift the spark control lever so as to move the circuit breaker box. Generally it is possible to advance or retard the spark control lever so that the contact points are separated, then the push button may be operated to produce the spark to fire the charge.

3. The wire U simply completes the circuit between the push button and the wire M2 that leads from the primary winding of the coil.

4. No, the points marked M and V at the top of the switch have no connection with the semi-circular piece to which the wire U and the wire from the push button are connected.

5. For a four-cylinder motor this magneto should run at crankshaft speed.

POINTS OUT FINE ROAD

Marquette, Mich.—Editor Motor Age—Readers of Motor Age doubtless will be interested to know that one of the finest stretches of road in the west is the route from Marquette to Ishpeming, Mich.

The road is a natural dirt highway, surfaced with blue limestone, which abounds in this territory. The entire stretch has a beautiful, and at the same time, restful color, and the surface is as smooth as new asphalt. After putting a car over the hurdles on the rough roads of the upper peninsula, it is a genuine pleasure to find an improved highway like the Marquette-Ishpeming pike.—Charles Meier.

WIRING OF MEA MAGNETO

Corning, Iowa—Editor Motor Age: Through the Readers' Clearing house will you give wiring diagram for the Mea Magneto for 4-cylinder motor. Does this magneto require coil, and if so, what kind?—F. C. R.

A wiring diagram of the Mea Magneto is shown in Fig. 5. The arrangement of the high tension wires C in this diagram would fire the cylinders 1-4-3-2, but to fire in the common order 1-3-4-2 one would have but to connect the wire leading to No. 4 plug, to No. 3 plug, and change the one leading to No. 3 plug, to No. 4 plug. The armature in this magneto carries a low-tension primary and a high-tension secondary winding connected in series, consequently no auxiliary induction coil is required. The low-tension winding ordinarily is short circuited by a breaker which opens at certain points of each revolution with the result that a high voltage is generated across the high tension winding at the moment of the break, and a spark is produced across the spark gap in the cylinder to which it is connected. In the diagram the primary current is generated in the coarse winding P and serves to induce a current in the secondary winding B which passes through the connecter ring and a brush supported by the brush holder G. The high tension lead C communicates between this brush holder G and the revolving segment of the high tension distributor H. The ground connection of the spark plugs I is represented by the dashed lines A. The primary circuit is represented by the line B which shows communication between the circuit breaker E and the armature. The condenser is represented at F.

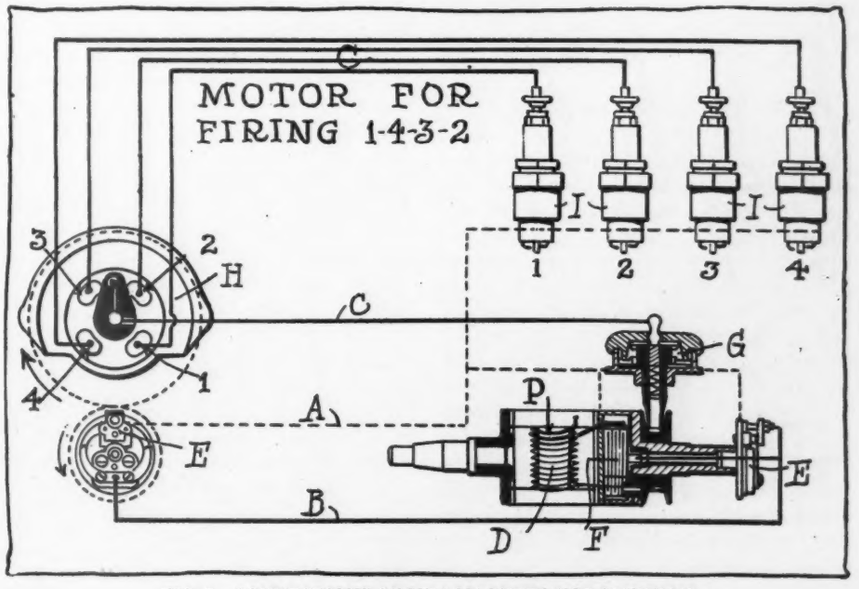


FIG. 5—CONNECTIONS OF MEA MAGNETO FOR IGNITION

From the Four Winds

LEGAL RULING—The agreement of two or more persons to take and use another's motor car without authority is held in State vs. Davis (S. C.) 34 L.R.A. (N. S.) 295, to be punishable as a criminal conspiracy.

Grand Rapids to Have Club House—The Grand Rapids Automobile Club will have a new $20,000 clubhouse on a tract of land near Plainfield, Mich., 10 miles north of the city, by next summer. The exact site of the building will overlook Grand river at one of its prettiest stretches.

Ohio Does Big Tag Business—State Registrar of Motor Cars J. A. Shearer has begun the work of distributing 1912 plates. Up to Christmas he received about 6,000 applications for licenses. All of these will be attended to before the first of the year. During 1911 there were approximately 46,000 cars registered in Ohio and it is believed the number will exceed 50,000 in 1912.

Good Example—The Lancaster Automobile Club of Lancaster, Pa., has discovered that a true bill of indictment for failure to keep its highway in repair had been found against the Lancaster and Elizabethtown Turnpike Co., and the club solicitor was instructed to press the suit to conviction. He also reported that condemnation proceedings against the Rothville turnpike have been instituted.

After Money for Roads—Petitions from every township in Genesee county, Mich., and from the city of Flint asking for the submission of a proposition to bond the county for $500,000 for good roads, will be presented to the board of supervisors at its January session. The county road commissioners have about completed the map showing the roads to be affected and the routes for proposed new highways.

Trucks Save City Money—In March, 1911, the board of public works of Indianapolis bought two one-cylinder gasoline trucks for the field corps of the city engineering department. Henry W. Klausmann, city engineer, says that the two trucks have performed the work of three horse-drawn vehicles, thus saving not only the expense of an additional vehicle and its maintainence but the salary of an additional corps of men as well. Mr. Klausmann says that the actual cost of operating the two trucks since March 1, including gasoline and all repairs, has been $12.50 a month. The city is now paying $20 a month per head for feeding horses at livery stables. It is probable that the remaining three corps of the engineering department will be given motor vehicles in the spring. The Indianapolis board of public safety will soon ask bids for a combination hose and chemical wagon to cost not to exceed $5,500. and for a touring car to be used for emergency runs by the police and to cost not to exceed $5,000.

To Make Gettysburg Roads—The seven roads entering Gettysburg provided to be rebuilt by the state of Pennsylvania under the Sproul road act, are all to be equipped with sign boards next year according to a statement made by State Highway Commissioner E. M. Bigelow.

Washington Broadening Out—The annual meeting of the Automobile Club of Washington will be held January 6, at which time it is expected a movement will be inaugurated to change the form of the organization. At the present time the club is conducted along social lines, which necessarily restricts the membership. The plan is to pattern the club after the Buffalo club, making every motor car owner eligible to membership.

Delaware Year Book—The Delaware Automobile Club has issued its year book for 1912. It is larger than any of its predecessors and contains much information, including a list of the members, objects of the association, advantages of membership therein, by-laws of the association, a schedule of data in the hands of the secretary, the motor vehicle law of the state of Delaware, important features of the motor laws in other states, details of routes to and from Wilmington in all directions, and also a list of hotels and garages in this and other states.

Indianapolis Needs Garages—With all of the present garages filled to capacity, there is immediate need for additional garages in Indianapolis. The provision for garaging in the last 2 years has not kept pace with the demand for such service, and as a result many persons are being obliged to erect small, temporary garages at their homes. During the early days of the motor car industry every agency had a garage in connection. Increased rents and ground values, however, have resulted in many agencies occupying quarters only large enough for the display of a few cars and for office purposes. Garages that have been erected in the exclusive residence districts are said to be filled to capacity and many of them must enlarge or seek new quarters. Thus far, however, there has been no inclination to charge excessive prices for garage service. Prices at present are from $10 to $15 a month for runabouts; $15 to $20 a month for touring cars and from $25 to $30 a month for electrics. Repair work ranges from 60 to 75 cents an hour. One of the inducements for people to buy cars has been the steady reduction in the price of gasoline during the last year or so. At the present time it is possible to contract for gasoline at 9½ cents a gallon from the oil companies. A majority of the garages charge 15 cents a gallon.

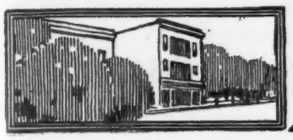
Minnesota Chauffeurs Elect—The Minnesota State Chauffeurs' Association has elected officers as follows: President, F. W. Oliver; vice-president, L. B. Whitney; recording secretary, Darwin Meyers; financial secretary, L. F. Marks; treasurer, D. R. Meyers; trustees and examiners, W. W. Abel, E. Vogt, F. Miller and N. W. Nelson.

Buffalo Club Election—Harry Thorp Vars has been elected president of the Automobile Club of Buffalo. Charles Clifton was elected vice-president, and James H. McNulty treasurer and, of course, Dai H. Lewis was put in for another year as secretary. The directors are E. R. Thomas, George C. Diehl, Maurice M. Wall, Henry P. Ford, E. P. Chalfant, A. C. Hoefler and J. A. Kramer.

To Revive Coast Climb—The Box Springs hill-climb, just outside of Riverside, Cal., may be revived in February. February 22, Washington's Birthday, is the date selected. This classic was one of the first climb held in California and for several years continued to be the most important. When it was discontinued Redlands leaped into the field with the Mile-high climb, but it is understood that this event will be allowed to lapse this season, which will help Box Springs.

Scouts Going South—To meet the increasing demand for the latest and most accurate road data in the southern states a pathfinding trip under the direction of the Touring Club of America will start within a fortnight from Augusta, Ga., going to Nashville by way of Atlanta and Chattanooga. This trip, which will cover upwards of 600 miles, will be made with the Touring club's officials Thomas six-40 in charge of the southern vice-president, D. D. Armstrong of Atlanta.

Watertown Has Live Club—John W. Weeks, president of the newly organized Watertown Automobile Club, of Watertown, N. Y., visited the Automobile Club of Syracuse recently to learn what procedure is necessary to the signboarding of roads, issuing of maps and routes and preparation of work advancing favorable legislation. Mr. Weeks says the new club has 100 members, all workers, and that it intends this coming season to thoroughly post Jefferson county highways. Watertown is in the heart of the north country made famous by Irving Bacheller in his writings.



Among the Makers and Dealers

NEW White Advertising Man—James A. Harris, Jr., has been appointed advertising manager of the White. He formerly was in the sales department.

Morrison Makes a Change—A. E. Morrison has resigned as factory director of the Cole Motor Car Co., Indianapolis, and has gone to Detroit, Mich., to become western sales manager for the R. C. H.

Miller Increases Stock—The Miller Rubber Co. of Akron, Ohio, which manufactures Miller tires and tubes, has increased its capital stock from $500,000 to $1,000,000. It is necessary to increase the plant to twice its present size to take care of the demand for this product.

Tradesman Commits Suicide—Louis M. Steiner, for many years in charge of the manufacturing department of the Goodyear Rubber Co., 382-84 East Water street, Milwaukee, Wis., committed suicide as the result of despondency over continued ill health. He had been in a sanitarium for 6 months.

Show at World's Fair—Preliminary steps are about to be taken to insure for the world's fair in San Francisco in 1915 the greatest exhibition of cars and accessories ever displayed in this or any other country. The movement to this end will be launched by J. A. Marsh, president of the San Francisco Motor Car Dealers' Association.

New Kissel Manager in Chicago—D. P. Choate, formerly connected with the Chicago House Wrecking Co. as general merchandise manager, has been appointed manager of the Chicago Kisselkar branch which has had its territory enlarged so as to take in Illinois, Indiana, Iowa and Ohio. Harry P. Branstetter, former manager, will remain with the branch but will devote all his time to selling cars.

Studebakers Take Inventory—About 350 men employed at the E-M-F plant in Port Huron, Mich., had a 2 weeks' vacation as the result of the factory being closed down for inventory. The Studebaker Corporation now has eight plants located in Michigan and Canada and all were closed at the same time. It was no vacation for the office forces, however, as the office men were compelled to work all the harder during the inventory.

Chase Addition Completed—The Chase Motor Truck Co., of Syracuse, N. Y., has completed its large three-story addition in Wyoming street. Some 18,000 square feet of floor space are now added to the present facilities of the company. During the last 2 months a network of Chase agencies has been spread across the country, and new ones include Milwaukee and Kenosha, Wis.; Minneapolis, Minn.; St. Louis, Mo.; Omaha, Neb.; Newark, N. J.; New Brunswick, N. J.; Baltimore, Md.; Charlotte, N. C.; Buffalo, N. Y.; Wheeling, W. Va.; Plymouth, Mass.; Springfield, Ill., and Springfield, Mo.

Coast Truck Plant Moves—The F. L. Moore Co., Los Angeles, Cal., has moved into its new factory. The present capacity of the plant is four trucks per week, and it is the intention of the company to increase this.

Indianapolis Trade Election—At the annual meeting of directors of the Indianapolis Automobile Trade Association the following officers were elected: President, Harry L. Archey; vice-president, Frank Staley; Frank L. Moore, treasurer, and F. Ellis Hunter, secretary.

Berkshire Moving to Cambridge—The Berkshire Automobile Co. of Pittsfield, Mass., has decided to move to Cambridge, a temporary factory having been secured near the Shoe and Leather building there. Later on a new building will be erected. Mayor Barry is after other motor plants to locate in his city.

Truck Plant Talked Of—Negotiations are in progress for the establishment of a new car factory in Findlay, Ohio. Ludwig Leitner and M. Weiting, two Findlay men, have patented a new chainless-drive motor truck and arrangements are being made to organize a corporation to manufacture the new vehicle.

Railroad to Try Gasoline Motor—The Big Four Railroad Co. is considering the advisability of competing with the electric lines in various parts of Ohio by operating a gasoline car service on short stretches of its track. Two gasoline cars, it is argued, could be operated more cheaply and with better service than steam trains. Managers of the company have sent several of its officials to Detroit to watch the operation of gasoline cars on the Ann Arbor line.

New Rambler Home in Hub—The Thomas B. Jeffery Co., of Kenosha, Wis., has just concluded negotiations with a big Boston real estate firm for the erection in the Back Bay of what will be one of the most pretentious motor homes in the country. It will be located on Commonwealth avenue in the Fenway section, where the Peerlees, Packard, Locomobile, Winton, Matheson, Lozier and Autocar homes are placed. The new home for the Rambler will be larger than some of the others, however, as it will be a four-story structure with 60,000 square feet of floor space. It will be 216 feet long on Commonwealth avenue and have a setback of 127 feet, allowing for artistically graded areas in front. The total cost of land and building will be approximately $250,000 and the Jeffery company has taken a lease of it for a number of years. It is expected that it will be ready for occupancy about June.

Bay City After Duplex Plant—The Duplex Coil Co., of Fond du Lac, Wis., manufacturing coils, ignition devices and electric lighting systems for motor cars, has received an offer to move its plant to Bay City, Mich.

Texans Visit Buick Plant—After a trip of more than 1,500 miles in their private car, the Texas representatives of the Buick Motor Co. recently made a trip of inspection through the company's Flint plant and also inspected the factories of the Imperial Wheel Co., the Durant-Dort Carriage Co., the Weston-Mott Co., and others.

Lima to Have a Show—Arrangements are being made by the dealers of Lima, Ohio, to hold a show some time in February, the date to be fixed later. The Auditorium will be secured for the show. A temporary organization for the show was formed as follows: Oliver DeWeese, president, and Cliff Counsellor, secretary-treasurer.

Hess Quits Franklin—Herbert Hess, for the past 15 months general manager of the Franklin Automobile Co., Syracuse, N. Y., has resigned to go into the real estate, loan and insurance business. Mr. Hess has been associated with the Franklin company for the past 5 years, first as traffic manager, then as manager of the commercial car department, and since 1910 as general manager. No successor to Mr. Hess has yet been named.

E-M-F Appointments—Frank H. Smith has been appointed assistant sales manager of the Studebaker E-M-F factory. C. E. Stebbins has been assigned the management of the Sioux Falls, S. D., branch of the company and H. W. Miller takes the management of the office force of the sales department, vacated by Mr. Stebbins. C. R. Newby leaves the management of the Sioux Falls branch to take charge of the Minneapolis branch, formerly managed by Mr. Smith.

Murphy Made Manager—E. B. Murphy has been made manager for the Minneapolis Automobile Dealers' Association. He formerly was with the Studebaker Corporation. The date of the show, which is to be in the Auditorium, has been changed to February 19-22. The Minneapolis Automobile Show Association dates in the armory are February 17-24. W. R. Wilmot is manager. He has just returned from Detroit and Chicago. The St. Paul Motor Car Dealers' Association show is to be February 12-17, in the Auditorium. W. R. Wilmot is manager.

Brief Business Announcements

SCRANTON, Pa.—The Wyoming garage will handle the Ohio car for 1912.

Greenville, O.—The Central Auto Co. has taken the agency for the Stoddard-Dayton line for 1912.

Montreal—The St. Louis Automobile Garage has been appointed local agent for the sale of the Cutting.

Lima, O.—The Majestic Auto Co. has renewed its arrangement to sell Franklin cars in this territory for another year.

Dayton, O.—H. H. Bracton, handling the Oldsmobile and Oakland, has opened a salesroom at 140 West Main street.

Dayton, O.—C. E. Bowman has established tire repair depots at 350 West Monument street and 59 Stratford avenue.

Dodge City, Kas.—James P. McCollom has purchased the Santa Fe Trail garage from E. J. Oliphant and will handle the E-M-F, Overland and Cole.

Toronto—The sale of Ohio cars in Canada will in future be controlled by the American Motor Sales Co., a new concern which has been incorporated in Toronto.

Portland, Ore.—The Auto Reconstruction Co. has been incorporated. The principal stockholders of the new concern are F. A. Daley, president, and Julius Goldsmith, secretary.

Sandwich, Ont.—Incorporation has been granted the Ford Motor Co., with capital of $1,000,000, and head office at Sandwich. The incorporators are: Henry Ford, of Detroit; F. L. McGregor, of Windsor, and others.

New York—The S. K. F. Ball Bearing Co., 50 Church street, has opened an office in Chicago to facilitate the handling of western business. The new office will be in 1505 Heisen building, and in charge of C. A. Winn.

San Francisco, Cal.—Don Lee, Cadillac representative for California, recently returned to Los Angeles from San Francisco. Lee is building a new Oakland branch and contemplates erecting a large building in San Francisco.

Syracuse, N. Y.—Charles E. Reynolds, of Syracuse, N. Y., has recently been made a district manager for the Chase Motor Truck Co. His territory covers Chicago and certain portions of the middle west. He has established his headquarters in the Marquette building, Chicago.

New York—The Schildwachter Carriage Co., Park avenue and One Hundred Twenty-eighth street, has accepted the Sternberg agency, and will maintain a service garage, and carry a line of all parts. The Leighton & Hancock Motor Truck Co., of 16 East Walnut street, Columbus, Ohio, has taken the Sternberg agency for Columbus and vicinity.

New York—A sales office of the Kerosene Gas Producer Co. has been opened at 1926 Broadway.

Chicago—The International Harvester Co. is erecting at 1814-16 South Michigan avenue a new building for its motor car department which will be ready in the spring.

Kansas City, Mo.—The Bond Motor Car Co. has broken ground for a modern three-story garage and salesroom on motor row. This concern will continue its representation of the Franklin car.

Columbus, Ohio—The E-M-F and Flanders Sales Co. has been incorporated with a capital stock of $10,000 to operate a sales agency for E-M-F and Flanders motor cars. The incorporators are George E. Thomas, H. H. Kellenberger, A. C. Secrest, David Thomas and Franklin Rubrecht.

Windsor—Letters of incorporation were recently granted to the Canadian Two-in-One Auto Co., which recently was organized at Windsor. The company is capitalized at $200,000 and the following are the provisional directors: S. Cole, G. A. Smith, F. E. Bowen, A. R. Bartlet and F. A. Hovey.

Vancouver, B. C.—The Central Auto and Supply Co., Franklin dealer in this territory, has begun the rebuilding of its establishment, which was destroyed by fire some months ago. It will build a two-story concrete garage 68 feet by 68 feet, the front portion being of sheet iron construction.

Columbus, O.—Upon the application of the Hearne Tire and Rubber Co., N. J. Ruggles has been named receiver for the Capital Supply and Mfg. Co. of 24 East Town street. The defendant company, which handles supplies of all kinds, admits insolvency. Outstanding obligations are said to amount to $3,000.

San Francisco, Cal.—The Standard Motor Car Co. has closed a contract with J. B. Enloe of Tulare county to handle the Stoddard-Dayton exclusively. Enloe will open a fine garage in Lindsay, Cal. A. B. Abrott will handle these cars in Danesville, and the Livermore garage will handle their make in Livermore.

Saskatoon—A new concern with strong financial backing has just been formed in Saskatoon under the name of the Standard Auto and Supply Co. This new firm has secured the agency for northern Saskatchewan for the E-M-F 30 and Flanders. It is going into the wholesale accessories line and has already secured property and will build one of the most modern garages in western Canada.

Pasadena, Cal.—Washburn Brothers, of Pasadena, have secured the agency for the Buick and Reo cars in that city and vicinity.

Whittier, Cal.—The Ford agency has been added to the roster of business houses in Whittier, McKenzie & Bellows of Long Beach having opened an agency at Starbuck & Caldwell's garage. F. L. Darling is the local representative for Whittier and surrounding territory.

Lansing, Mich.—The National Coil Co. has moved into its new quarters on North Cedar street, occupied by the Ideal Motor Co. until the building was gutted by fire last spring. The rebuilt plant was made especially to accommodate the coil company. The company manufactures magnetos, coils and spark plugs.

Cleveland, O.—The Eckenroth Automobile Livery Co. has been incorporated with a capital stock of $5,000 to operate a garage and repair department and run a taxicab and livery business. The incorporators are Rudolph H. Eckenroth, Peter L. Eckenroth, Hazel C. Eckenroth, Harry J. Eckenroth and Carlton F. Schultz.

Los Angeles, Cal.—Leon T. Shettler announces a slight change in his business. He has incorporated under the name of the Leon T. Shettler Co. and taken in as a partner Captain G. W. Neuis of Redlands, Cal. He also will build a new salesroom and garage on Pico street and will retain his mechanical department on West Washington street.

New York—Before sailing for home at the end of his recent visit to this country, Lancia, the former race driver, arranged for a new American selling agency to handle the car Italian made which bears his name. This is the T. E. Adams Co., in which T. E. Adams and E. Little are associated. Headquarters have been opened at 235 West Fifty-eighth street, New York city.

Dayton, O.—Agencies for the Dayton airless tires have been appointed as follows: C. J. Cross, general sales agent for the east, 1878 Broadway, New York; J. L. Dulin, 404 North Capitol avenue, Indianapolis; state of Kansas, E. Linge, 123 West Fifth street, Topeka; L. P. Hornberger, Pacific coast territory, Alaska building, Seattle, Wash.; Charles P. Jaeger, northern Illinois, northern Indiana and southern Wisconsin, 2123 Michigan avenue, Chicago; Meridian Sales Co., Maryland, Virginia and District of Columbia, 729 Fifteenth street, Washington,

D. C.; Cox & Sorenson, state of Oregon, 719 Chamber of Commerce building, Portland, Ore.

Roanoke, Va.—The Virginia Motor Car Co. is building a new garage on Jefferson street, which will cost $15,000.

Mt. Vernon, O.—Walter Lake has leased the old gas house on South Mulberry street, and will open a garage and repair shop soon.

Los Angeles, Cal.—A new tire company has entered the Los Angeles field at 311 West Pico street, namely, the Shawmut Rubber Co. The branch will be in charge of J. Clark Smith, J. Warren Smith and S. H. Ellis, Jr.

Des Moines, Ia.—The Means Auto Co. has closed a contract which will make the company the Iowa distributing agency for the Marathon car. Clarence J. Rose has joined the Means company and will have charge of the branch business.

Indianapolis, Ind.—H. Geoffrey Fletcher, traveling representative for the American Motors Co., who has handled the central and western states for the past 18 months, has been appointed sales manager of the foreign district, embracing Porto Rico, Cuba, and Mexico, and has just commenced a general tour of this territory.

Cleveland, O.—The Cleveland Transfer Auto Livery and Baggage Co. has been incorporated with a capital stock of $5,000 to do a general business in transferring baggage and freight by means of motor trucks. The incorporators are Moses R. Brailey, Florence E. Brailey, G. H. Knippenberg, Edward Kirkland and James E. Mathews.

Boston, Mass.—C. F. Whitney and C. H. Barney have formed a partnership as the Whitney-Barney Co. and they have taken on the Selden and Lion cars and the Gramm trucks for eastern Massachusetts. Salesrooms have been opened on Boylston street, where the Matheson formerly was handled. Fred E. H. Lucas has gone with the new company as retail sales manager.

Los Angeles, Cal.—The Motor Service Co., Incorporated, has opened in Los Angeles. The new concern will operate a garage service upon unique lines. The building contains many new features that should appeal to the motor car owner—an elaborate system of floor, wall and roof ventilation carries off all gases and smoke; a new system of cleaners by vacuum, compressed air and electric polishers.

Ontario, Cal.—Two new garages and additions being put on the old ones, show the growth of the business in Ontario. One of the new garages is being built for D. B. Wynne, agent for the E-M-F and Flanders, by O. H. Morse on his property on the west side of Laurel street. The cost of the building is $1,000. A garage building also is being erected on the same street for F. A. Saunders, who will conduct a storage and rental establishment. C. L. Lampkin, of the Ontario Mfg. Co., is putting an addition to his garage on A street.

Sacramento, Cal.—J. O. Lauppe will hereafter handle the Jackson line of cars in Sacramento.

Grand Rapids, Mich.—The Westcott is having its introduction to the local trade through the Grand Rapids Auto Co., agent for this district.

Malden, Mass.—Harry C. Stratton, for a long time the agent for the Kissel in Boston before it became a branch, has formed the Stratton Automobile Co., with Joseph S. and Grace W. Stratton as directors with him.

Toledo, O.—The Buckeye Auto Service Co. has been incorporated with a capital of $5,000 to engage in the general delivery and truck business with motor vehicles. The incorporators are Fred H. Kirkley, Trude Wooster, Aaron B. Cohn, Vada C. Southard and Harry Beeman.

Grand Rapids, Mich.—The Buick Auto Sales Co. has elected the following officers: President, Julius LaBoutel; vice-president, Frank S. Elston; secretary, Wilbur Lawrence; treasurer, William Martineau; general manager, Fred S. Hughes. The company has secured temporary quarters with the Hupmobile Sales Co. at 15 North Ionia street but will soon have a permanent location at Division and Pleasant streets. The Buick line will be handled.

Jacksonville, Fla.—The Merrill-Stevens Co. has secured the agency for the Cartercar.

Seaforth, Ont.—The Northern Motor, Limited, is representing in Canada the Paige-Detroit.

Olympia, Wash.—The Motor Supply and Investment Co. has taken the agency for the Hudson. M. E. Johnson will handle the Hudson cars in Centralia, Wash.

Los Angeles, Cal.—W. W. Wurzburger, formerly connected with the Pioneer Commercial Auto Co., has taken a position of sales manager with the Moreland Motor Truck Co. of the same city.

Boston, Mass.—Charles Addison Malley, who formed the Malley Motor Car Co. to handle the Warren and the Flanders electric, has sold out his interest in the agency and has accepted a position as eastern district manager for the King Motor Car Co. of Detroit.

Boston, Mass.—W. H. Stevens, for several years with the Park Square Automobile Station and later with the Stoddard-Dayton agency, has taken on the agency for the National here. He has secured temporary quarters in the Autocar building on Beacon street.

Recent Incorporations

Savannah, Ga.—Motor Vehicle Co., capital stock $200,000; incorporators, Sigo Myers, Seymour Stewart, W. A. Collins and others.

Clio, S. C.—Hubbard Motor Car Co., capital stock $3,000; incorporator, J. L. Hubbard.

Newbern, N. C.—Newbern Motor Co., deal in and repair motor cars.

New York—Detmar Auto Sales Co., capital stock $20,000; incorporators, John McLaren, F. B. Knowlton and E. C. Inderlied.

Buffalo, N. Y.—Carroll Tire Co., capital stock $20,000; incorporators, J. Gregson, George Cunliffe and J. E. Gregson.

New York—National Rim Co., capital stock $150,000; to manufacture parts and accessories; incorporators, L. G. Fleming, J. J. Hafner and E. N. Brandt.

Syracuse, N. Y.—Julian Motor Co., capital stock $200,000; to manufacture and deal in motors; incorporators, J. S. Brown, G. A. Young and E. W. Lawson.

Portland, Me.—Morrill and Higgins Motor Co., to manufacture and deal in motors.

Chicago—Swanson Motor Car Co., capital stock $50,000; to manufacture motor cars and accessories; incorporators, C. E. Swanson, E. E. Challenger, M. E. Callion.

Chicago—Lee Motor Co., capital stock $50,000; to manufacture accessories; incorporators, C. A. Johnson, O. J. Lee and R. C. Henderson.

Newark, Del.—Newark Garage and Electric Co., capital stock $50,000; incorporators, G. Fader, E. G. Fader and A. F. Fader.

Chicago—Devon Garage, capital stock $2,000; incorporators, R. E. Beaubien, W. J. Burns and J. E. Hurtubise.

New York—Ormond Motor Car Co., capital stock $100,000: directors, George H. Howell, Robert McKeller and Thomas Downs.

Newark, Del.—Newark Garage and Electric Co., capital stock $50,000.

Boston, Mass.—Rex Motor Co., capital stock $1,000; incorporators, Harold C. Stetson, Henry W. True and C. Frank Moore.

Salem, Mass.—Blue Ribbon Automobile Service Co., capital stock $25,000; to deal in motor cars and supplies; incorporators, G. B. Sheppard, J. D. Sharman and F. E. Hurley.

Worcester, Mass.—White Motor Car Co., capital stock $5,000; incorporators, H. I. Cashman, P. M. Hale and T. Francis Manion.

Malden, Mass.—Stratton Automobile Co., capital stock $5,000; incorporators, H. C. Stratton, J. S. Stratton and G. W. Stratton.

Peoria, Ill.—Palm Gum Tire Co., capital stock $1,500; to manufacture composition for tire repairs; incorporators, W. Swords, Jr., Harry H. Duchesne and W. Turnbull.

Auburn, Ind.—Omaha-Auburn Auto Co., capital stock $10,000; directors, C. Eckhart, F Eckhart and M. Eckhart.

Canton, O.—Stark Auto Co., capital stock $20,000; incorporator, W. H. Burgener.

Cleveland, O.—Brooks-Norton Motor Sales Co., capital stock $10,000; incorporators, W. K. Stanley, C. L. Norton, J. W. Brooks, H. N. Pettibone, B. L. A. Leighley.

Ashtabula, O.—High Level Auto Co., capital stock $10,000; to deal in motor cars; incorporators, J. C. Topper, E. Gardner, S. F. McDonald, Fred Squires and T. P. Fitzgerald.

Richmond, Va.—Adjustable Wheel Co., capital stock $100,000 to manufacture wheels; officials, R. E. Bruce, C. Vaden, J. H. Pinner and J. C. Davis.

Roanoke, Va.—Roanoke Motor Car Co., capital stock $25,000; incorporators, F. Welch, Sr., J. R. Shickle, Frank Welch, Jr.

Dallas, Tex.—Regal Motor Car Co., capital stock $1,000,000.

Beaumont, Tex.—Texas Storage and Transfer Co., capital stock $10,000; to buy motor trucks.

Wilmington, Del.—American Tire and Rubber Mfg. Co., capital stock $1,500,000.

New York—Hewitt Motor Co., capital stock $1,000,000; to manufacture and deal in motor cars; incorporators, A. Ames, R. F. Henley and J. O. Wingrave.

Dover, Del.—Motor Owners Tire Co., capital stock $300,000; to manufacture tires.

Springfield, Mass.—Morse-Readio Auto Co., capital stock $150,000; officials, U. Readio, Edward M. Whiye and Glenn E. Morse.

St. Louis, Mo.—Electric Garage and Service Co., capital stock $2,000.

Utica, N. Y.—Grim-Bronner Auto Co., capital stock $5,000; incorporators, H. D. Grim, N. B. Bronner, C. W. Grim and H. G. Bronner.

Milwaukee, Wis.—Automatic Motor Devices Co., capital stock $1,000; incorporators, H. B. Webb, C. J. Dellfield and James T. Drought.

Nashville, Tenn.—Hermitage Auto Livery Co., capital stock $10,000; incorporators, L. W. Jacobs, W. F. Jacobs and E. L. Holt.

Evansville, Ind.—Columbia Taxicab Co., capital stock $10,000; directors, H. E. Hulsman, W. Wheeler, A. C. Mathias and E. C. Kinkle.

The Motor Car Repair Shop

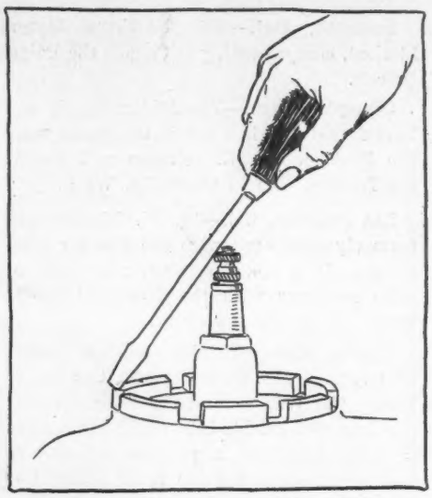


FIG. 1. TESTING A SPARK PLUG

By short circuiting a plug in this manner the effect is the same as if the cable or wire were disconnected from it. Whenever a good plug is short-circuited there is a decided regular change in the operation of the motor; but when a faulty plug is short-circuited, if it has been causing the cylinder to misfire regularly, there will be no change in the operation; whilst if the faulty plug has been missing intermittently there will be a marked regularity in the firing of the other cylinders when it is short-circuited

Causes of Misfiring

TWO of the most common causes of misfiring in a motor are: Faulty ignition due to oil or dirt on the points of the spark plugs; and poor compression, due to ill-seating valves. It should be of interest, therefore, to know of a simple method of determining which of these causes might be giving the trouble when misfiring occurs. The best way of locating any kind of motor trouble is by a process of elimination; that is, by thoroughly testing out one possible source of trouble at a time, and one feature after another, until the cause of the trouble is found.

Assuming, for instance, that the car begins to run irregularly and with a jerky motion; about the first thing that the experienced motorist would do would be to open the cut-out, disengage the clutch and speed up the motor to see if the jerky action of the car might be due to misfiring in one or more of the cylinders. If the motor failed to speed up and run regularly with the clutch disengaged and the throttle opened, the spark lever should be advanced and the throttle slowly opened and closed several times, causing the motor to race for a few seconds at a time. This is done in an endeavor to blow off any oil or dirt that may be adhering to the sparking points of a plug. Should this fail, the car should be stopped, if not already stopped; the motor should be throttled down so as to run fairly slowly, then each spark plug should be tested individually. To do this, many motors are provided with knife switch connections to the spark plugs, by means of which they may be readily disconnected from the ignition circuit. Where these switches are not fitted, however, a plug may be very effectively cut out of the circuit by making contact between the top terminal and the cylinder, with a screwdriver or the like, as shown in Fig. 1. Whenever a good plug is short-circuited in this manner, there is a decided regular change in the operation of the motor; but when a faulty plug is short-circuited, either there will be no change in the operation of the motor, or the rest of the cylinders will continue to fire in rythmical order. When a plug is suspected, a new plug should be fitted, and the old plug cleaned or repaired at a time when convenient.

Poor Compression Common Cause

When a test of the spark plugs fails to show up any faulty plugs, or the replacement of a plug in a misfiring cylinder fails to eliminate the trouble, the compression in each cylinder should be tested by cranking the motor over slowly, and carefully noting whether or not the same amount of effort is required to overcome the pressure in each cylinder. It is most probable that when the compression in the misfiring cylinder is tested it will be found wanting. Ill-seating valves are the usual cause of poor compression, and the first thing to do after locating the cylinder in which the compression is poor, is to examine the valves, and see if there is a little space between the end of the valve-stem and the pushrod when the valve is closed. It should be possible to slide a thin piece of paper between the end of the stem and tappet when the valve is closed. When a motor is cold this space should amount to about the thickness of an ordinary business card; and when well warmed up, it should be possible to at least slide a piece of tissue paper about between stem and tappet with ease.

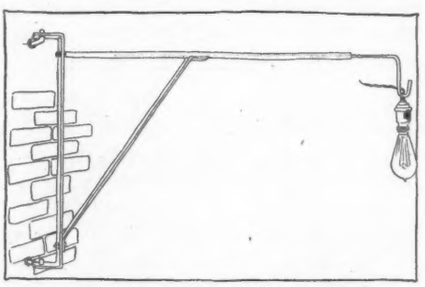


FIG. 2. A HANDY LAMP SUPPORT

This bracket is made from band iron, 1/4-inch steel tubing into which a 3-16-inch rod may telescope, a rod 3-16-inch in diameter with a hook formed at one end and a couple of pivot eyes of the same rod stock. Such a bracket could be used to a good advantage in many motor car repair shops.

If the clearance between stem and tappet is found sufficient, on both the inlet and exhaust valves, then most probably it will be necessary to remove the valve, clean off the seats, and perhaps grind in the valve so that it seats properly. When a valve is found to be badly pitted, and considerable grinding is necessary to reseat it, one should be careful to reckon with and readjust the valve-stem.

Regarding Tappet Adjustment

A short time ago the writer happened to notice a chauffeur bearing down most heavily on a valve that he was grinding in, still he was able to turn the screwdriver with comparative ease. Upon inquiring as to the length of time he had spent on the valve, he replied that he had been working on the one valve for an hour, and was unable to get out a number of deep pits. It was suggested that the valve stem might be resting upon the tappet; and an examination showed the suggestion to be correct. The tappet adjustment, thereupon, was lowered, the grinding operation resumed and the pits soon removed. The weight of the forearm should be all the pressure ever required.

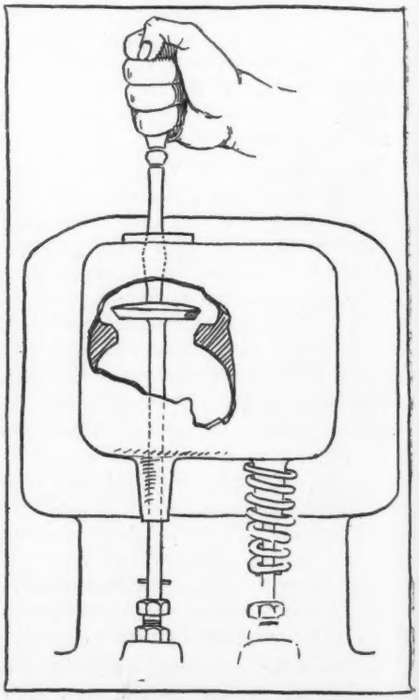


FIG. 3. ERROR IN VALVE-GRINDING

Though exaggerated, the illustration shows how an effort may be made to grind in a valve when the end of the stem is bearing upon the pushrod in a manner which prevents it from seating. One always should have consideration for the pushrod adjustment when grinding in a valve. One does not hasten the grinding operation by applying great pressure; the quickest method is to press lightly and lift the valve often